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THE WASPS OF THE GENUS SOLIERELLA IN CALIFORNIA (HYMENOPTERA, SPHECIDAE, LARRINAE)

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Field and laboratory studies on these small, active wasps were begun in 1920 and extended, with many interruptions, up to 1949. About 600 specimens of *Solierella*, chiefly from California, were assembled for study. More than half of this number were of the writer's own collecting. Also available for study was a large, well ordered collection of *Solierella* from Southern California provided by Mr. P. H. Timberlake of the Citrus Experiment Station, University of California at Riverside. Smaller but likewise interesting collections came from Dr. G. E. Bohart and from the California Academy of Sciences. Finally, a number of paratypes and other specimens were loaned by the United States National Museum.

Up to the present writing, there appear to be but three species of *Solierella* correctly reported from the State of California. These are: *S. striatipes* (Ashmead), *S. similis* (Bridwell), and *S. blaisdelli* (Bridwell). However, a critical examination of the material before me reveals twenty-three California species, of which fifteen are here described as new. California, therefore, is rich in species of this genus, and since these wasps are generally small and not too readily collected, additional species are sure to be found. Some species appear to have a rather limited distribution, others are widespread in the state and beyond, and several range at least to the Rocky Mountains. Certain small areas, sometimes but an acre or two in extent, may with close

collecting yield a relatively large number of species of *Solierella*. For example, nine species were taken by the writer at Menlo Park, San Mateo County, California, in July, and at Riverside, Riverside County, Mr. P. H. Timberlake collected eleven species during various months. Most of the species include June in their season. Species with the abdomen reddish seem more prevalent in the southern part of California. Naturally enough, not all the species have the same value; some appear rather isolated or set apart, while others form groups of closely related species. Variations in both markings and structure are not infrequent and add to the interest as well as the difficulty of the study.

The following is a list of the twenty-three species of *Solierella* known to occur in California:

1. *S. striatipes* (Ashmead)
2. *S. major* (Rohwer)
3. *S. sonorae* n.sp.
4. *S. lasseni* n.sp.
5. *S. boharti* n.sp.
6. *S. vierecki* (Rohwer)
7. *S. similis* (Bridwell)
8. *S. vandykei* n.sp.
9. *S. corizi* n.sp.
10. *S. nigra* (Ashmead)
11. *S. blaisdelli* (Bridwell)
12. *S. albipes* (Ashmead)
13. *S. bridwelli* n.sp.
14. *S. levis* n.sp.
15. *S. niteus* n.sp.
16. *S. clypeata* n.sp.
17. *S. timberlakei* n.sp.
18. *S. arcuata* n.sp.
19. *S. australis* n.sp.
20. *S. abdominalis* n.sp.
21. *S. bicolor* n.sp.
22. *S. sayi* (Rohwer)
23. *S. californica* n.sp.

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The name *Solierella* (Spinola, 1851, in Gay, Hist. fis. pol. Chile, Zool., vi, p. 349) is here used to include *Silaon* (Piccioli, 1869) and *Niteliopsis* (S. Saunders, 1873). Kohl (Die Gattungen der Sphegiden, Ann. des K. K. naturhist. Hofmus., Bd. XI, Heft 3, 1896, pp. 451-454) analyzes the genus *Solierella*. He unites *Solierella, Niteliopsis,* and *Sylaon* Kohl into one genus, but recog-

nizes these names as convenient for species grouping. He speaks of the variation in venation among these insects and shows that some species have the mandibles well excised on their outer side, others possess mandibles which are rather shallowly excised, and still others have these organs not excised. Kohl's view of this group of wasps is shared by some of the later students, including the writer. For a discussion of the genus *Solierella,* see Pate (Mem. Amer. Ent. Soc., No. 9, 1937, p. 59). Pate considers Herbst's genus *Lautara,* described from Chile (Bol. Mus. Nac. Chile, XI, p. 217, 1919), as in all probability congeneric with the typical species group of *Solierella.*

The type of the genus is *Solierella miscophoides* Spinola ([Gay], Hist. fis. pol. Chile, Zool., VI, p. 352, 1851).

Solierella has been accorded several positions in the classification of the sphecid wasps. The writer has not made an extended study of its relationships with other wasps. To him, *Solierella* seems best placed among the Larrinae.

The wasps of this genus measure from about 2.5 to 11 mm. in length. They are compact in build; the abdomen is sessile, and the ground color is usually black although frequently the abdomen is reddish and even more often creamy white or yellowish markings are present on the thorax and legs. Considerable difference in size may exist among individuals of a single species.

Solierella may be characterized as follows: Eyes entire, converging toward vertex; three perfect ocelli; mandibles entire within, sinuate to emarginate on outer (lower) side; marginal cell more or less truncate and appendiculate apically, three submarginal cells, the second petiolate, receiving one or both recurrent veins, anal lobe of hind wing small; middle tibiae with one apical spur; pygidial area not well defined.

The head is much used in classification. In most species of *Solierella* the mandibles are merely sinuate or very slightly notched on their lower side (2, 25, 76, 182).[1] In relatively few species they may be suddenly narrowed on their lower side somewhat before the middle length so that the basal portion has the upper and lower margins parallel or nearly so, and a tooth or lobe is thereby formed by this narrowing (127, 187). Such mandibles are not, properly speaking, definitely emarginate or excised, as in *Plenoculus* (186), a genus related to *Solierella.* Other *Solierella* have the mandibles intermediate in character. Figures 135 and 142 show moderately excavate mandibles. The malar space—that space between the base of the mandibles and the lower edge of the eye—is very narrow in the female, and very narrow to a length equaling about one-half the width of the mandible at the base, in the male. It is in sections V to VIII in my grouping of the species that the malar space is best developed, these sections being composed of the smallest species. The coloration of the mandibles appears relatively constant for group

1. The numbers in parentheses refer to figures in the plates.

or species. The clypeus, extending from the antennal sockets, is important in marginal outline and profile. Occasionally its anterior margin shows variations (183-185). Often a median carina is present on the clypeus. The disc is more or less tumid and its margin variously shaped. The occipital carina may run boldly into the gular suture, as in *S. corizi*, or it may disappear before reaching this suture, as in the small species. The antennae may be filiform to subclavate. In the male the last segment of the antenna may be normally developed, i.e., but little differentiated and slightly longer than the preceding segment; in many species the last segment is greatly developed so as to equal in length about the sum of the 2 to 6 preceding segments. In dried specimens the last segment may be in a more or less collapsed condition, although it seems always normally round or nearly round in cross section and terminates subconically. The comparative length of the segments is, I believe, sometimes subject to errors of statement due to the frequent telescoping of these segments. Finally, in a small group the males have the last antennal segment reduced, it being subglobular and shorter than the preceding. Particularly in large species the frontal carina may divide U- or V-like and sometimes widens suddenly toward the vertex to form a second but more poorly defined bottomless U (1, 2, 28). The ocelli may form a triangle from about equal to a right angle to one even more acute than an equilateral triangle, a line joining the two posterior ocelli being regarded as the base of the triangle (24, 86, 169). The width of the interocular space is also important in classification.

The legs have several important characters. On the posterior (or upper) inner side of the hind coxae there is a fine carina that is developed basally as a gently rounded lobe, a triangular production, or a thorn (61, 79, 110), according to group. In the male more or less of a stout thorn may be developed on the fore coxa beneath (144), while the fore trochanter is emarginate to a greater or lesser extent basally beneath (59, 85, 165). Also, in males in the groups containing the smaller species, there is a somewhat fusiform thickening of the hind tibiae, as viewed from above (177). Bristles on the outer side of the fore tarsi of the females may be sufficiently long to be regarded as a weak comb (36-39, 178, 181). In the forewing the marginal cell may be fairly parallel-sided, or more or less saccate at the base. The form of the second submarginal cell is of much importance, as also the position of the two recurrent veins, and the relation of the transverse-median and basal veins along the median vein. But variations are not infrequent (7, 9, 35, 84, 101, 103, 104). The dorsal part or disc of the propodeum sometimes has a U- or V-shaped area defined by a raised or carinate line (113, 114); this is a valuable but not altogether constant character. The sculpture of the disc may vary considerably within the species (compare 11 and 12). There is no well-defined pygidial area in *Solierella*, such as occurs in females of typical Larridae and in *Plenoculus*, where there is a bounding carina. In *Solierella*,

however, the pygidium is rather obscurely defined by a line of close-set, very short bristles. The form and dentition of the lobes of the aedeagus are useful for specific or for group classification, but the number of teeth may vary considerably, at least in the smaller species.

The practice of mounting specimens of these small wasps with jaws agape is very commendable. Thus the clypeus is exposed for study. Relaxing dried specimens for the arrangement of appendages may result in a chipped or broken clypeus or other injury to the specimen; moreover, the use of potassium hydroxide or even hot water tends to exaggerate carinae, causes antennal segments unduly to protrude from their sockets, produces certain shrinkage of the ocelli, and does other damage (60, 108, 141).

It is hoped that the numerous illustrations accompanying this article will help materially in the identification of species which are too often difficult to describe in words alone. Included among the plates are anatomical details of certain *Solierella* thus far not known to occur in California.

The works of other hymenopterists have been freely consulted. The studies of Mr. S. A. Rohwer, of the United States National Museum, have laid the foundation for systematic work on *Niteliopsis* and *Silaon*, based largely on specimens collected by himself in Colorado (Trans. Am. Ent. Soc., XXXV, pp. 108-116, 1909; Proc. U.S.N.M., 40, pp. 585-587, 1911). More recent workers in this group are Bridwell, Pate, and Krombein. In the Old World, V. Gussakovskij has published on palaearctic *Solierella* (Rev. Russe d'Ent., XXII, pp. 78-84, 1928; t.c. XXIV, pp. 232-235, 1930 [descriptions in Latin]).

A separation of the genus *Solierella* into natural groups may be expressed as follows:[2]

I

Second submarginal or cubital cell relatively longer and flatter, the distal or second transverse-cubital-vein side slightly longer than, or at least equal to the basal or first transverse-cubital-vein side; the cell almost always receives both recurrent veins; transverse-median beyond basal vein; a U- or V-shaped forking of the frontal carina more or less developed; ocelli forming an equilateral triangle, or nearly; posterior coxae with the inner dorsal carina developed basally as a gently rounded lobe; antennal segments of the female relatively long, the third segment equaling or slightly surpassing three times its apical diameter; last segment of male antenna normal, subequal with the preceding one; malar space almost lacking in the female, sometimes slightly developed in the male. This group includes our largest species: *striatipes* (Ashmead), *major* (Rohwer), *foxii* (Viereck), *fossor* (Rohwer), *sonorae* n.sp., *lasseni* n.sp., *boharti* n.sp., *modesta* (Rohwer).

2. This grouping is based mainly on California material and includes only those other species familiar to the writer.

II

Second submarginal cell much as group I, although a little shorter and receiving only the second recurrent vein; transverse-median beyond basal vein; frontal U well developed; antenna of female with length of segment three about twice its apical diameter; last segment of male antenna normal; posterior coxal carina developed basally as a gently rounded lobe. Species of medium size: *vierecki* (Rohwer), (=*parvus?* [Rohwer]).

III

Second submarginal cell much as in I, receiving both recurrent veins; frontal U or V not well developed; antennae and posterior coxal carinae about as in II; malar space very small in both sexes. Of medium size: *plenoculoides* (Fox), *similis* (Bridwell), *vandykei* n.sp.

IV

Second submarginal cell usually relatively shorter, tending to be equilateral, its distal side often shorter than, but sometimes as long as the basal side; the cell sometimes receiving both recurrent veins; transverse-median usually beyond basal; sometimes these two veins are interstitial; a short frontal V, or it is obsolete; ocelli forming a right angle triangle to a triangle somewhat greater than equilateral; posterior coxae with the inner dorsal carina basally developed thornlike; antennae moderately thickened to stout, the last segment in the male being about as long as the three preceding ones; malar space very small in female, sometimes slightly developed in the male. Small to moderately large species: *inerme* (Cresson), *lucida* (Rohwer), probably *iresinides* (Rohwer), *mexicana* (Rohwer), *mirifica* Pate, *corizi* n.sp.

V

First and second submarginal cells each receiving a recurrent vein, the second submarginal cell with the basal almost always longer than the distal side; transverse-median basad of basal vein; more rarely they are interstitial; no U- or V-shaped forking of the frontal carina developed; ocelli forming a triangle slightly greater than equilateral; clypeus produced mesad as a rather narrow lobe which in the male terminates in a spike or short point; last antennal segment of male at least equal to the two and a half preceding ones; malar space small in male, almost lacking in female. Small species: *nigra* (Ashmead), *rohweri* (Bridwell), *blaisdelli* (Bridwell), *kansensis* (Williams), *lagunae* (Williams) (Philippines), *affinis* (Rohwer).

VI

First and second submarginal cells each receiving a recurrent vein; mandibles suddenly or rather suddenly narrowed a little before their middle

length (mandibles distinctly emarginate exteriorly); no forking of frontal carina developed; antennae of male as in V; malar space in male about half the width of the mandibles at base. Small species: *albipes* (Ashmead), *bridwelli* n.sp.

VII

Venation as in VI; mandibles weakly to moderately emarginate; frontal carina and male antennae as in VI; clypeus of female broadly rounded out or broadly subtruncate, that of male subconically produced (males of *levis* and *nitens* unknown). Small species: *levis* n.sp., *nitens* n.sp., *clypeata* n.sp., *timberlakei* n.sp., *arcuata* n.sp., *australis* n.sp., *abdominalis* n.sp., *bicolor* n.sp.

VIII

Venation and malar space as in VII; mandibles weakly emarginate; clypeus rather narrowly produced mesad, the process lobed or toothed; ocelli forming approximately an equilateral triangle to one more acute than an equilateral triangle, this triangle placed farther forward than usual in *Solierella* in relation to the hind margin of the compound eyes at the vertex, a line tangential to the hind margin of the eyes being distant from the posterior ocelli by about their diameter. Small species: *sayi* (Rohwer), *californica* n.sp.

KEY TO SPECIES OF CALIFORNIA SOLIERELLA[3]

Females—antennae with 12 segments; abdomen with 6 tergites visible 1
Males—antennae with 13 segments; abdomen with 7 tergites visible 22

1. Second submarginal cell usually longer (10), its distal or second transverse-cubital side longer than the basal or first transverse-cubital side, receiving both recurrent veins (except in *vierecki*); transverse-median usually distad of basal vein; frontal carina forking to form a more or less obvious U or V at its upper end (1), and then usually more widely diverging to form a more or less poorly defined bottomless U in the ocellar region: posterior coxae with the inner dorsal carina developed basally as a gently rounded lobe (4, c) 2

—Second submarginal cell usually relatively shorter (80, 84, 102), the distal side usually shorter than the basal, or the cell may be equilateral; first and second submarginal cells each receiving a recurrent vein (except usually in *corizi*); frontal carina seldom forking to form a well defined U or V (exceptions are *vierecki* and to a lesser degree *corizi* and near allies), usually the frons is simply rounded, brow-like (95-98, 115); posterior coxae with inner dorsal carina sometimes developed basally as a thorn, or triangularly produced (79c, 110) 9

2. Antennae more slender, filiform, length of its third segment 3 times, or a little more, its apical diameter (3, 18, 22, 26, 29); a fore tarsal comb of long bristles usually developed (36-39). Large species 3

—Antennae stouter, length of segment 3 about 2 times its apical diameter (44, 52, 57); fore tarsal bristles short, not forming a comb (58) 7

3. The numbers in parentheses refer to figures in the plates.

3. All black; clypeus pointed somewhat beaklike; frontal U short, not well developed (21); length 6.5 mm. **boharti**, new species
—Abdomen reddish. 4

4. Usually all tibiae marked with pale yellow; no fore tarsal comb (40); clypeus produced into a rather narrow lobe with a low lateral tooth; a narrow, well-defined frontal U. Length 7-11 mm. **striatipes** (Ashmead)
—No pale markings; fore tarsal comb present. 5

5. Frontal U short and wide, the carinae low and obscure; at its widest portion the U is somewhat more than half the width between the compound eyes at that point (23); length of fore tarsal bristles a little more than the width of tarsal segments. Length 6-8 mm. **lasseni**, new species
—Frontal U longer, its carinae well defined; fore tarsal bristles about 2 times the width of the segments. 6

6. Frontal U not narrowed above where it joins the upper U (17); disc of propodeum with a median carina and with strong oblique and then, transverse striae, some of the oblique striae reaching well beyond the middle length of disc, length 9-10 mm. **major** (Rohwer)
—Frontal U somewhat narrowed above where it joins the upper U (28); disc of propodeum generally finely reticulate, with a fine median carina and some short radiating basal wrinkles; less often the wrinkles are better developed, thereby partially obscuring the reticulations. Length 7.5-8.25 mm. **sonorae**, new species

7. Frontal U well defined (43); first submarginal cell receiving the first recurrent vein; abdomen red, pronotum and legs marked with creamy yellow. Length 5 mm. **vierecki** (Rohwer)
—Frontal U poorly defined; second submarginal cell receiving both recurrent veins; abdomen black. 8

8. Clypeus steeply depressed just before its margin (67, 68); pronotum black; hind tibiae marked with creamy yellow. Length 6 mm. **vandykei**, new species
—Clypeus nearly evenly convex in profile (57 and c); pronotum usually, and hind tibiae rarely and then but slightly, marked with creamy yellow. Length 6-7 mm. **similis** (Bridwell)

9. Species 6-8 mm. long; rather coarsely sculptured; posterior coxae with inner dorsal carina developed basally as a stout thorn (79); transverse-median a little distad of basal vein; thorax and legs marked with creamy yellow; radial vein of hind wings continued as a dark streak (80). **corizi**, new species
—Smaller species; posterior coxae with process less well developed; transverse-median usually basad of, sometimes interstitial with basal vein; radial vein of hind wing not terminating as a dark streak. 10

10. Clypeus produced mesad as a simple, rather narrow rounded lobe (95-97). 11
—Clypeus not produced as a simple, rather narrow shining lobe; it may be broadly, semicircularly produced (116, 118), rather broadly subtruncately produced (121, 122, 124), rather narrowly so produced and usually 3-lobed or with a median tooth (155, 157). 12

11. Usually pronotum, postscutellum, and all the tibiae marked with creamy yellow; disc of propodeum with a U-shaped area defined by a raised line (114) **blaisdelli** (Bridwell)
—All black; puncturation and other sculpture generally coarser; area on disc of propodeum defined more often as a truncated V than as a U, the sides being nearly straight (113) **nigra** (Ashmead)

12. As seen from the side the mandibles are suddenly narrowed from before their middle length on the lower side, thereby forming a shoulder or notch, the broader basal portion being thus nearly parallel-sided (127, 187); mandibles largely pale yellow; clypeus subtruncately produced (126, 128) ..... **albipes** (Ashmead)

—Mandibles not suddenly thus narrowed, moderately emarginate (135, 142), or not emarginate exteriorly (182), the side of the broader basal portion converging.... 13

13. Disc of clypeus broadly depressed from about one-third of its length from the base (between the antennal sockets) to near its margin so that this area, which is smooth and shining, appears concave in profile (122, c, female); mandibles moderately emarginate exteriorly (135); antennae stout; pygidial area strongly and closely punctate; tibiae and tarsi with much creamy yellow; abdomen black ..... **bridwelli**, new species

—Disc of clypeus convex in profile (118 c, 119), though it may be upcurved before the margin 14

14. Abdomen largely red 15

—Abdomen black 17

15. Clypeus broadly semicircularly produced, though the rather ample shining margin is very slightly emarginate mesad (119), the disc in profile being rather strongly convex and sloping steeply from about its middle length to the margin; mandibles shallowly and gradually emarginate. Length 3.75 mm. ..... **timberlakei**, new species

—Clypeus semicircularly produced (116), though tending to be subconic in outline, the disc in profile moderately convex, the marginal strip very slightly upturned; mandibles moderately emarginate (as in *bridwelli*). Length 4.5 mm. 16

16. Antennae stout, subclavate, the terminal segment hardly or not twice as long as its basal diameter (132); no impressed line extending from anterior ocellus posteriorly ..... **bicolor**, new species

—Antennae less stout, the terminal segment about twice as long as basal diameter (133); a distinct smooth impressed line extending from anterior ocellus posteriorly ..... **abdominalis**, new species

17. Clypeus rather broadly subsemicircularly or subtruncately produced; ocelli form a triangle slightly greater than equilateral, a line joining the two posterior ocelli being the longest (as in 131); posterior ocelli less than their diameter removed from a line joining the posterior margin of the compound eyes at the vertex 18

—Clypeus rather narrowly subtruncately produced, this production about equaling in width the interspace of the antennal sockets (155, 157, 167); ocelli barely forming an equilateral triangle (169) or the triangle may be more acute; posterior ocelli approximately their diameter removed from a line joining the posterior margin of the compound eyes at vertex 21

18. Longer bristles of fore tarsi about as long as the width of their respective segments (181); clypeus subtruncately produced, the margin rather wide and smooth (121); mandibles shallowly emarginate (142); wide basal portion of mandibles dark brown or blackish; creamy white markings at apex beneath, of the fore and middle femora (though sometimes nearly effaced) and on the hind tibiae. Length 3.8 mm. ..... **levis**, new species

—Longer bristles of fore tarsi much shorter than width of respective tarsal segments; clypeus arched subconic or subtruncate; wide basal portion of mandibles pale yellow, rarely a little darker; fore and middle femora and all the tibiae marked with pale yellow. Length 4-4.5 19

19. Clypeus subtruncately produced, the production very slightly lobed mesad (124); disc of propodeum with a U-shaped area marked by a raised line. Shining and finely punctate..... **nitens**, new species

—Clypeus more perfectly truncate; disc of propodeum without margined U-shaped area. Less shining and finely though more strongly punctate (text fig. 1)..... **clypeata**, new species

—Clypeus arched subconic; disc of propodeum lacking a margined U-shaped area, or it is incompletely defined..... 20

20. Antennae stout, subclavate, the terminal segment about twice as long as thick (137); propodeal pleura subopaque, with many very fine close parallel striae..... **australis**, new species

—Antennae less stout, the terminal segment clearly more than twice as long as thick (138); propodeal pleura shining, with about 8-10 well-separated parallel striae..... **arcuata**, new species

21. Clypeus produced as a simple rather narrow subtruncation, the margin of which is very gently arched (167); longer spines of the fore tarsi fully as long as their respective segments; fore and middle femora and all the tibiae marked with pale amber yellow. Length 4 mm..... **californica**, new species.

—The clypial subtruncation is produced as a low median tooth (155, 157); fore tarsal spines shorter than their respective segments (180); fore and middle femora with a small creamy yellow mark; tibiae black. Length to 4.5 mm..... **sayi** (Rohwer)

22. Last segment of antennae as long as or a little longer than the preceding one (6, 31, 51), thus never greatly developed nor very small and subglobular; second submarginal cell receiving both recurrent veins (except in *vierecki*). Generally larger species with the frontal U or V often well defined (2, 31)..... 23

—Last segment of antennae greatly developed, about equaling the preceding 2-6 segments (78, 88, 108; text figure 2); usually the first and second submarginal cells each receive a recurrent vein (102); frontal carina not dividing to form a well defined V (98) except in *corizi*..... 26

—Last segment of antennae stubby and subglobular, shorter than the preceding one (172); clypeus drawn out into a rather narrow subtruncation with a median tooth (156, 160)..... 34

23. Clypeus truncately produced, the truncation lobed mesad (2, 31, 69); extremity of aedaegus with many fine teeth (15, 30, 74)..... 24

—Clypeus subtruncately produced, its rounded margin obscurely lobed or toothed mesad, or it is broadly triangularly produced (45); extremity of aedaegus with about 5-8 teeth (49, 55, 64)..... 25

24. Frontal U about one and one-half times as long as wide (2); abdomen reddish. Length 5-8 mm..... **striatipes** (Ashmead)

—Frontal U about as long as wide (69); abdomen black. Length 4-5 mm..... **lasseni**, new species

25. Frontal U well developed (45); clypeus broadly subtriangularly produced; first submarginal cell receiving first recurrent vein; abdomen reddish..... **vierecki** (Rohwer) (=**parva?** [Rohwer])

—Frontal U obscure (60); second submarginal cell receiving both recurrent veins (62); clypeus subtruncately produced; abdomen black..... **similis** (Bridwell)

26. Produced portion of clypeus 3-dentate (78); second submarginal cell usually receiving both recurrent veins; a well developed thorn on posterior coxae basally above (79); first segment of posterior tarsus of about equal thickness throughout; hind

wings with several dark streaks apically. Length 5-6.5 mm. ..... **corizi**, new species

—Produced portion of clypeus not 3-dentate; first and second submarginal cells each receiving a recurrent vein; posterior coxae with the carinal process lower and more triangular; first segment of posterior tarsus as viewed dorsally somewhat thickest toward middle length (177). Length 3-4.5 mm. 27

27. Clypeus truncately produced mesad (as in text figure 1); last antennal segment about as long as the two preceding segments combined (text figure 1) **clypeata**, new species

—Clypeus not truncate; last antennal segment relatively longer..... 28

28. Clypeus a median subtriangular lobe usually terminating in a distinct spike (97c, 98, 185), or it may terminate in a slight nipple (183, 184); mandibles usually blackish or reddish brown at base with yellowish or brownish along the middle length or beyond, rarely clear creamy yellow or whitish basally; mandibles shallowly emarginate..... 29

—Clypeus more or less triangularly produced, not spiked or nippled (except in *albipes*, which, however, has the largely creamy yellow mandibles strongly notched); mandibles usually distinctly creamy yellow at or near base, no raised line defining a U-shaped area on disc of propodeum, or this area not clearly developed..... 30

29. Thorax and legs with creamy yellow; often a U-shaped area on disc of propodeum (114)..... **blaisdelli** (Bridwell)

—Usually entirely black and slightly larger; U-shaped propodeal area present or not ..... **nigra** (Ashmead)

30. As seen laterally the mandibles are suddenly narrowed before the middle length along their posterior or lower side, thereby forming a shoulder or notch (127) which is evidently a development of the margin into a semitransparent lobe, making the broad basal part nearly parallel sided (mandibles distinctly emarginate)..... 31

—Mandibles not or only moderately emarginate, so that basal portion has converging rather than parallel or nearly parallel sides (135, 182; text figure 2)..... 32

31. Last segment of antenna better developed, as long as the six preceding segments (136); clypeus produced as an arcuate-conic lobe (123) that is tumid in profile and rather steeply depressed anteriorly (122c, ♂)..... **bridwelli**, new species

—Last segment of antenna not exceeding the preceding 3½-4 segments; clypeus gently convex, conically produced or with a small nipple..... **albipes** (Ashmead)

32. Abdomen largely reddish; pale creamy yellow markings on fore coxae beneath, as well as on thorax, femora, tibiae, and tarsi..... **abdominalis**, new species

—Abdomen black, but margin of tergites testaceous and slightly reddish; pale markings present on fore coxae beneath..... **bicolor**, new species[4]

33. Antennae stouter (139); sides of propodeum subopaque, with very fine close striae on reticulate surface..... **australis**, new species

—Antennae less stout (140); sides of propodeum shining, the striae fewer and well separated and on a smoother base..... **arcuata**, new species

34. The produced truncate portion of clypeus with a median spikelike process (171); ocelli forming a triangle slightly more acute than an equilateral one (169); all tarsi with a pale yellowish stripe..... **californica**, new species

—The produced truncate portion of clypeus with a low tooth (156, 160, 162); ocelli forming an equilateral or very slightly more acute triangle; all tarsi usually black ..... **sayi** (Rohwer)

4. This may be the male of *bicolor*; the association of the sexes has not been established. See the description.

DESCRIPTION OF SPECIES

1. **Solierella boharti** Williams, new species

(19, 20, 21, 22, 38)

Female, holotype: Length 6.5 mm. Black; head and thorax opaque, abdomen shining, the slender mandibles reddish apically. Head mainly finely granulate; clypeus produced into a wedge with a shoulder interrupting somewhat beyond the middle length, the margin rather broadly polished, carina strong, extending to apex where it is only slightly depressed; frontal carina not strong, dividing above antennae to form a short indistinct U with a median incised line basad; vertex rather narrow, the ocelli forming an equilateral triangle, the lateral ocelli less than their width from the compound eyes; antennae rather slender, segments 3 and 4 subequal. Thorax mainly finely granulate, scutellum with definite punctures; propodeum with a fine median carina and some longitudinal carinae on the sides, the posterior face shining and with transverse carinae and a subtriangular depression. Outer bristles of fore tarsi a little longer than apical width of their respective segments. Second submarginal cell receiving both recurrent veins; transverse-median distad of basal vein. A little silvery pile and some pale mesotibial spines.

Holotype, female (C.A.S. No. 6161) in fresh condition from **Mammoth Lake, Mono County, California**, July 5, 1936 (R. M. and G. E. Bohart).

This fine species is named in honor of Drs. R. M. and G. E. Bohart.

A rather slender and finely sculptured species of the *fossor* group, but with the interocular space at vertex relatively narrow.

2. **Solierella lasseni** Williams, new species

(23, 25, 26, 69-74, 174)

Female, holotype: Length 8 mm. Black; head and thorax generally opaque, abdomen reddish, mandibles reddish apically, fore femora narrowly reddish at base, tarsal joints 2-5 reddish brown. Head and thorax mainly finely granulate-punctate; middle portion of clypeus produced, terminating as a broad wedge, the margin broadly polished, carina sharp and a little downbent at apical portion; frontal carina forming an imperfect U with a median incised line basally; only an indication of the upper U; vertex moderately wide, ocelli in an equilateral triangle, lateral ocelli less than their width from the compound eyes; antennae slender, segment 3 a little longer than 4. Scutellum and postscutellum rather polished, closely punctate; disc of propodeum finely granulate, with a delicate median line and some short basal ones, the pleura more shining, with longitudinal striae, posterior face shining and with strong

transverse striae and a median groove opening dorsally into a smooth area. Outer spines of fore tarsi as long as to slightly longer than apical width of their respective segments; second submarginal cell receiving both recurrent veins, transverse-median and basal veins almost interstitial, the transverse-median being slightly distad. A little silvery pile and some pale mesotibial spines; lateral fringe of pygidium of very short dark bristles.

Male, allotype: Length 4 mm. Black; head and thorax opaque, mandibles reddish apically, legs dark brown, tegulae and tarsi brownish, wings infuscate apically, apex of abdominal segments narrowly brownish, posterior tibiae with a yellowish-white stripe dorsally. Middle portion of the clypeus doubly produced (69), carina strong; malar space about ⅓-¼ as long as width of mandibles at base; frons wide, granulate, the double U fairly strong; vertex granulate to densely punctate; ocelli forming a triangle very slightly greater than equilateral, the posterior ocelli more than their diameter from the compound eyes; a slight depression behind the fore ocellus; antennae fusiform, segments 3 and 4 subequal. Meso- and metanotum closely and strongly punctate; disc of propodeum finely reticulate, median carina present, pleura finely longitudinally striate, posterior face strongly wrinkled and with a shining furrow. Fore trochanters excavate basally (73); carina of posterior coxae developed as a low rounded process, about as in Fig. 61; second submarginal cell receiving the two recurrents near each extremity, about as in Fig. 34; transverse-median slightly distad of basal vein. Apical half of last visible ventral segment narrow. Pile: moderate, silvery.

Holotype, female (C. A. S. No. 6162) with unworn clypeus but rather frayed wings from **Summit Lake**, at about 6700 ft. elevation, on the slopes of **Mt. Lassen, California**, July 21, 1937 (F. X. Williams); *allotype*, male (C.A.S. No. 6163) in fresh condition from Baltimore Park, Marin County, California, July 2, 1920 (F. X. Williams). Paratypes, 1 female with clypeus rather worn but wings in good condition, same data; 2 males, 1 Redwood City, San Mateo County, June 27, 1922, 1 Tahoe, Placer County, 6500 ft., July 1925 (F. X. Williams). Other specimens: all from Mt. Diablo, Contra Costa County, at 2000 ft., viz., 3 females collected on May 21 and June 14, 1949, 6 males on June 14, July 26, August 2, 8, 17, and 26, 1949 (F. X. Williams), at the lower edge of the "chaparral" formation. The 3 females are 6 mm. long and thus considerably smaller than the Mt. Lassen specimens. The males range from 3.5 to 5.2 mm. and some have the apex of the abdominal segments quite dark.

This species, which is related to *S. boharti*, may be considered the far-western representative of *S. fossor* (Rohwer). It differs from *fossor* chiefly in the more poorly defined frontal U (compare 23 with 29). The male *lasseni* is certainly very close to *S. modesta* (Rohwer, 1909) of which I have studied a paratype (No. 13607, U.S.N.M.).

3. Solierella sonorae Williams, new species

(24, 27, 28, 39)

Female, holotype: Length 7.5 mm. Black; head and thorax subopaque, mainly finely and closely punctate, though the rather dense silvery pile tends to conceal this; abdomen red, mandibles reddish apically, apex of trochanters narrowly marked with yellow, tarsi reddish brown. Produced portion of clypeus forming a broad-angled wedge, the margin broadly polished, carina sharp though merging at apex into the smooth marginal area; frontal carina dividing above the antennae to form a strongly margined narrow U that expands toward ocellus to form a poorly defined U that lacks the base; vertex narrow, ocelli forming a triangle more acute than equilateral, the lateral ocelli less than their width from the compound eyes; 3rd antennal segment a little longer than the 4th. Propodeal disc finely reticulate, with a delicate median carina and short diverging basal ones; pleura with longitudinal wrinkles, posterior face shining, transversely wrinkled and with a median groove widening dorsad. Outer bristles of fore tarsi fully twice longer than width of their respective tarsal segments. Transverse-median very slightly distad of basal vein. Some short pale meso- and metatibial spines. Lateral fringe of pygidium of pale bristles.

Holotype, female (Citrus Experiment Station, Riverside, California), in fresh condition, from **eight miles south of Indio, Riverside County,** March 28, 1936 (P. H. Timberlake); on ground. Paratypes; 4 females: 1, Palm Springs, May 22, 1917 (E. P. Van Duzee), in collection of the California Academy of Sciences; 1, Quail Springs, Colorado Desert, California, October 5, 1939 (A. J. Basinger); 2, Cathedral City, Riverside County, November 11, 1939, "on ground" (P. H. Timberlake).

In the paratypes the transverse-median and basal veins are interstitial or very nearly so. Sometimes the propodeum shows transverse striations in addition to reticulations. The paratype from Palm Springs is a little over 8 mm. long.

Allied to *S. fossor,* but separated chiefly by its narrower vertex and frontal U. (compare 28 and 29.)

4. Solierella major (Rohwer)

(17, 18, 36)

Silaon major Rohwer, 1917, Proc. U. S. Nat. Mus. 53:247-248. Female. North Yakima, Washington. Length 10 mm.

One female, San Diego, California (F. E. Blaisdell) agrees well with Rohwer's description. The outer bristles of the fore tarsi are from twice as long as to a little more than double the width of their respective tarsal seg-

ments. It is related to *S. striatipes,* resembling it in the long narrow double U, general outline of the clypeus, which however lacks the well-defined shoulder of *striatipes,* and in the rather coarsely sculptured propodeal disc with its radiating and its parallel wrinkles. It lacks the yellow markings of *striatipes* and has a much longer tarsal comb. The ocellar triangle is more acute than equilateral.

The male seems undescribed.

A female *Solierella* from St. Johns, eastern Arizona, collected by Graham Heid, May 29, 1931 (California Academy of Sciences) much resembles *S. major,* though differing from it in the more arcuate frontal U, the apparently somewhat shorter 3rd antennal segment and in the pale foretarsal bristles.

5. **Solierella striatipes** (Ashmead)

(1-16, 40)

Niteliopsis striatipes Ashmead, 1899, Ent. News, 10:9. Male, not female as stated. "Habitat, California. Carl F. Baker Collection," No. 2375. Type, No. 5065. U. S. N. M.

Females of this species vary from about 7 to 11 mm. long. It is apparently our largest *Solierella.* It was taken in good series chiefly in July 1922, 1925, and 1937, at San Rafael and Mill Valley, Marin County, and at Menlo Park, San Mateo County. Other specimens studied are: 1 male, Bryson, Monterey County, May 19, 1920 (E. P. Van Duzee), and 1 male, Davis Creek, Modoc County (C. L. Fox), both specimens being from the collection of the California Academy of Sciences; 1 male, Riverside, June 12, 1938 (P. H. Timberlake) "Flying over the ground"; 1 female, Buck's, Plumas County, 5070 ft., July 23, 1937 (F. X. Williams). Finally, in the summer of 1949 many of these wasps were collected by the writer on Mt. Diablo, Contra Costa County, at 2000 ft.

The male is from 5 to 8 mm. long and has the clypeus doubly produced (2), and the ocelli forming an equilateral triangle. The dense puncturation is largely concealed by pale brassy and silvery pile. The propodeal area is marked by a delicate median carina and other carinae radiating fan-like, but more or less transversely towards the apex (11), or the apical portion may lack distinct wrinkles, or occasionally may have the wrinkles more or less as concentric ovals (12). The yellowish stripe on the tibiae may vary in extent, sometimes quite disappearing on the 1st and 2nd tibiae. The wings are broadly infuscate apically.

The female appears to be undescribed. It is like the male in most respects. The clypeus is produced into a rounded, smooth-edged lobe with a shoulder on either side; the 3rd antennal segment is a little longer than the 4th; the

bristles of the fore-tarsal comb do not exceed the width of their respective segments.

This species was determined for me by the late Miss Grace Sandhouse of the United States National Museum.

6. **Solierella vierecki** (Rohwer)

(43-51)

Niteliopsis vierecki Rohwer, 1909, Trans. Amer. Ent. Soc., 35:112. Male and female. "Habitat, Boulder, Colorado, July 24, 1908 and August 4 and 5, 1908 (S. A. Rohwer)."

One female, Riverside, California, June 11, 1926 (P. H. Timberlake); on *Euphorbia albomarginata*. This specimen is nearly 5 mm. long and agrees very well with a paratype from Colorado kindly loaned me by the United States National Museum. Three females taken by me at Pueblo, Colorado, August 4, 1922, are also typical. The double U is well marked.

A male paratype of *S. parva* (Rohwer) from Boulder, Colorado, has a dull reddish abdomen (as has also the type) and the writer believes that *parva* is a synonym of *vierecki*.

This is a distinct species with a wide frons that seems to me more closely related to *S. plenoculoides* (Fox) than to the *fossor* group (compare 49 with 55).

7. **Solierella similis** (Bridwell)

(57-66, 175, 176)

Silaon similis Bridwell, 1920, Proc. Hawaiian Ent. Soc., 4:402-403. "Described from a single female collected at Berkeley, California, May 12, 1912 (Bridwell)—."

A fair series of both sexes taken by the writer in the following localities in California: Menlo Park and Redwood City, San Mateo County; Lagunitas, San Rafael, and Mt. Tamalpais, Marin County; Bucks, Plumas County, 5070 ft.; Tahoe, Placer County, 6500 ft.; and Danville, and Mt. Diablo, Contra Costa County. The Danville and Mt. Diablo specimens were taken during the summer of 1949.

This is a rather opaque black species up to about 7 mm. long. The double U of the wide frons is obsolescent; there is a shining fovea in the middle of the frons, the pronotum is short in profile (175), the second submarginal cell receives both recurrent veins or the second recurrent and second transverse-cubitus are interstitial or nearly. The pale yellow markings on the pronotum and hind tibiae, as described in the type, may be nearly or quite absent.

The male is much like the female, but the clypeal production has a low median tubercle.

This species is very close to *S. plenoculoides* (Fox) described from New York and Colorado. Rohwer (1909) describes the male of *plenoculoides* and has seen specimens of this sex from Fedor, Texas, and Boulder, Colorado. The writer took a male in Ramsey Canyon, Arizona, June 17, 1920. *S. similis* has rather thicker antennae than *plenoculoides* and the aedeagus has a shorter, fuller crook towards the apex (compare 53 and 63). The ocelli in *similis* form a very slightly greater triangle than equilateral.

A series of 8 males and 1 female from the National Museum and collected at Forest Grove, Oregon (L. P. Rockwood) are all black save for the partly pale pronotal lobes. Structurally they correspond to *similis*, of which they may be considered a dark phase.

8. **Solierella vandykei** Williams, new species

(67, 68)

Female, holotype: Length 6 mm. Black; mandibles reddish apically, a creamy yellow stripe on posterior tibiae above, apex of abdominal segments pale yellowish brown. Clypeus produced into a broad rounded lobe, its median carina strong, extending to near margin which is steeply depressed steplike; frons granulate, subopaque, the median groove in the subobsolete U widely polished; ocelli forming an obtuse triangle slightly less than a right angle triangle, their interspace with some fine longitudinal striae, the posterior ocelli slightly less than their diameter removed from the compound eyes; commencing along the outer side of each posterior ocellus is a rather shining low carina that extends forward beside the eye margin to form the arched sides of the subobsolete upper U. Antennae moderately stout, articles 3 and 4 subequal. Pronotum very slightly notched mesad, meso- and metanotum shining, rather closely and finely punctate, mesopleura finely punctate but with a smooth embossed area below wing bases; disc of propodeum rather opaque, with fine, chiefly oblique wrinkles to the longitudinal carina, the disc rather well rounded and somewhat margined apically, the pleura finely reticulate wrinkled, posterior face reticulate and with a shining subtriangular fovea. In the left forewing the second submarginal cell receives the first recurrent vein very near its base; in the right wing the first recurrent and the first transverse-cubitus are interstitial; transverse-median slightly distad of basal vein. Abdomen shining. Vestiture: moderate silvery pile.

Holotype, female (C. A. S. No. 6164), in fairly fresh condition from **Tahoe, Placer County, California**, 6500 ft., July 1925 (F. X. Williams). Paratype; one female in more worn condition; same data. The paratype has the first recurrent vein of both wings interstitial with the first transverse-cubitus, and the disc of the propodeum rather coarsely reticulate, with a fine median carina and some oblique wrinkles basad.

Superficially like *similis*, but easily separated by the clypeus which is steeply depressed just before the margin.

Named for Dr. E. C. Van Dyke, pioneer entomologist, who has done much to further entomology in California.

9. Solierella corizi Williams, new species

(75-87)

Female, holotype: Length 6.5 mm. Black; head and thorax rather shining, abdomen shining, mandibles reddish preapically and with a faint median yellow spot; hind margin of pronotum except narrowly mesad, most of lateral lobes, tegulae and axillary sclerites, postscutellum, a stripe on the tibiae above, the four anterior femora beneath near base to apex, and apex of posterior femora, creamy yellow; tarsi brownish, wings infuscate apically; in addition the hind wings have several dusky streaks to apex, the most clearly marked one being the extension of the radial vein to margin. Clypeus produced into a lobe, rather flat wedgelike apically, where it is smooth and shining, median carina strong, not extending to margin, the disc on either side coarsely punctate; frontal carina dividing V-like, well marked for a short distance; along the eyes above, on each side is a smooth inarched swelling that ends near the posterior ocelli, the latter forming an approximately right-angle triangle; antennae subclavate with segment 3 longer than 4, and 12 longer than 11. Mesonotum with deep, rather irregularly scattered punctures, sulcate mesad and to a lesser degree at either side; disc of propodeum margined, truncate-triangular, with carinulae radiating mainly fanwise from base, the pleura with fine longitudinal striae, posterior face transversely striate and with an oval, very finely reticulate depression. Posterior coxae on their inner side above with a thornlike process toward base (79, c); second submarginal cell receiving both recurrents, the second about the middle; transverse-median distad of basal vein. Intersegmental constrictions of abdomen distinct; pygidium practically bare, shining and with very fine scattered punctures. Vestiture: sericeous pile, often brassy tinged, dense on frons, sides of propodeum, and somewhat bandlike on abdomen.

Male, allotype: Length 6.25 mm. Marked as in the female, but the markings are lemon yellow instead of creamy yellow, with additional markings as follows: antennae with segments 6 and 7 beneath, and 8 and 9 entirely, pale yellow to yellowish brown, 10 chiefly brownish, 11 and 12 brown; mandibles black basally, a yellow spot at median length, apical part reddish to darker. Clypeus drawn out mesad as a tumid tridentate process, the middle carina strong, extending to margin; antennae stout, subclavate, article 8 drawn out beneath, 7 and 8 to a lesser degree, last article tapering cone-like and about as long as the preceding 3½ articles. Fore coxae strongly excavate posteriorly

for the reception of the trochanters which themselves are deeply excavate beneath and provided at the outer side of the excavation with a curved bristle; posterior wings with 6 fuscous streaks at the apical portion (80); last visible ventral segment tapering to parallel-sided apical portion; aedeagus sickle-shaped, with fine teeth within.

Holotype, female (C. A. S. No. 6165) in fresh condition, **Menlo Park, San Mateo County, California**, August 8, 1937 (F. X. Williams). *Allotype*, male (C.A.S. No. 6166), in fresh condition, topotypical, July 25, 1937 (F. X. Williams). Paratypes: 1 female, San Rafael, Marin County, July 28, 1922 (F. X. Williams); 1 female, Manor, Marin County, July 28, 1937; 4 females, Menlo Park, San Mateo County, August 1937; 6 males, Menlo Park, July-August, 1937; 4 females, Danville and Mt. Diablo, Contra Costa County, summer of 1949 (F. X. Williams); and 11 specimens all taken by P. H. Timberlake, consisting of 6 females, Riverside, Riverside County, with respective data as follows: September 12, 1947, on *Gutierezia californica*, September 27 and October 19, 1927, on *Hemizonia wrightii*, May 14 and 18, 1925, and May 18, 1928, on *Eriogonum fasciculatum*; 1 female, Strathmore, Tulare County, September 30, 1935, on *Eriogonum angulosum*; 1 female, Lindsay, Tulare County, June 19, 1933, on *Asclepias eriocarpa*; 3 males, Riverside, May 14 and 18, 1925, on *Eriogonum fasciculatum*, and May 8, 1925, on *Euphorbia albomarginata*.

A well-marked species that varies considerably. Some of the more southernly examples have a good deal of yellow on the mandibles. The 3 males and 6 females taken at Riverside by Timberlake have a pair of swellings behind the two posterior ocelli, with which they form a subquadration (87). None of the specimens from central California, which includes the two females from Tulare County, lying north of the Tehachapi Mountains, possesses such swellings. These swellings are more or less characteristic of some of the other species of this group (91). The second submarginal cell usually receives both recurrents, but sometimes the first and the first transverse-cubitus are interstitial, and rarely is it received by the first submarginal cell close to its apex (84). It is chiefly in the males that such variations occur.

Solierella corizi is evidently very close to *S. mirifica* Pate described from Pima County, Arizona. I have not seen *mirifica*, but the differences between the two appear to be chiefly those of markings on the antennae. And in *mirifica* the thorax is described as opaque, whereas in *corizi* it is shining and apparently less densely punctate. *S. corizi* is also related to Rohwer's *iresinides* described from Guatemala. Dr. Karl V. Krombein has kindly compared the two species and furnished the following notes on the unique type of *iresinides*, as differing from a male *corizi*: "median carina of clypeus expanding toward apex to form a narrow platform; portion of occipital carina opposite middle of compound eye expanded to form a short low, rounded lamella, infumated streaks not present in hind wings or only faintly indicated."

10. Solierella blaisdelli (Bridwell)

(96, 100, 104, 105, 110, 111, 114, 120, 143, 144, 148, 154, 183-185)

Silaon blaisdelli Bridwell, 1920, Proc. Hawaiian Ent. Soc., 4:401. "Described from a single female collected at San Diego, California, March 29, 1891 (Dr. F. E. Blaisdell). Type in the author's collection."

I have studied a considerable series of both sexes of this species, my determinations having been made from a female specimen from Whittier, California, in the collection of P. H. Timberlake, and which he compared with Bridwell's type. It is characterized by the almost invariably dull reddish brown mandibles, rather narrowly lobed clypeus, ocelli arranged in a triangle slightly greater than equilateral, and the propodeal disc marked U-shaped by a raised line. The transverse-median and basal veins are often interstitial; the pronotum, the lobes and tegulae, postscutellum, the four anterior femora apically beneath, and all the tibiae above are marked with creamy white. Occasionally specimens lack the postscutellar mark, while the leg markings may be reduced. The dorsum is shining and finely punctate. Above the mesopleural pit below the wing bases there is a glabrous shining spot, sometimes absent in the male because of the silvery pile. Length 3.5-4 mm.

The male seems undescribed. It varies considerable, even to the aedeagus, the lobes of which may bear from 4 to 9 teeth. In well-favored specimens the tumid clypeus terminates in a distinct spike, in others this is indicated by more or less of a nipple (183-185). Such variations may occur in specimens taken at the same time and place. The ocelli may equal an equilateral triangle. The last segment of the antenna is often collapsed and is equal to the 3½-4 preceding segments combined. The fore coxae beneath may be armed with a small mucro. The fore trochanters are well excavated at the base. The tarsi are largely creamy white. Figures 120, 144, and 154 show details of a rather aberrant male from the Sierra Nevada.

The following have been studied: 4 specimens labelled "*S. affinis* Rohwer" from the U. S. National Museum consisting of 1 female, Alameda County, July 1907 (W. M. Giffard) and 3 females, Los Angeles, September 1907 (C. H. Hicks); 13 specimens taken by P. H. Timberlake as follows: 1 female, Riverside, California, June 14, 1932, on *Euphorbia albomarginata*; 1 female, Riverside, May 6, 1933, on *Alyssum maritimum*; 9 males and 1 female, Whittier, California, August 11, 1920, the female at fennel (*Foeniculum vulgare*) flower and the males at glands of sunflower, in river bottom; 1 male, Riverside, June 21, 1946, on *Euphorbia albomarginata*; and 43 specimens collected by F. X. Williams as follows: 1 male, Buck's, Plumas County, 5070 feet; 1 female, Point Lobos, San Francisco, June 29, 1920; 1 male, San Rafael, Marin County and 11 males and 11 females, Menlo Park, San Mateo County, all in 1937 and chiefly during the summer; and 1 male, Mt. Diablo and 3

males and 3 females, Danville, Contra Costa County and also 8 males and 3 females, Mill Valley, Marin County, all during the summer of 1949. This species occurs also at Tucson and the Huachuca Mts., Arizona (F. X. Williams, collector).

This insect is very close to *S. affinis* (Rohwer) which was described from Colorado in 1909. According to the description of *affinis* and also in the specimens which I have seen from Colorado, the mandibles are largely yellowish white. *S. blaisdelli* is related to the Hawaiian *rohweri* Bridwell (1920)[5] from which species it differs in being more generally marked with creamy yellow (occasionally all-black *rohweri* occur), in the non-carinate or nearly non-carinate clypeus, the presence of a glabrous mesopleural spot, and a longer propodeum which has a U-shaped rather than a truncate V-shaped enclosure. It is also related to *S. nigra* (Ashmead).

11. Solierella nigra (Ashmead)

(97, 106, 107, 113)

Plenoculus niger Ashmead, 1899, Psyche, 8:339. Female. "Habitat, Colorado. Carl F. Baker Collection No. 2170." "Type No. 5068, U. S. N. M."

Niteliopsis niger Rohwer, 1909, Trans. Am. Ent. Soc., 35:115. Male and female. "Habitat, Florissant and Boulder, Colorado."

Specimens were examined from the following localities in California: 3 males and 3 females, Riverside (P. H. Timberlake), with data as follows: 1 male, September 23, 1924, on *Euphorbia albomarginata*; 1 male and 1 female, May 11 and September 15, 1925, on *Euphorbia albomarginata*; 1 female, June 14, 1932, on *Euphorbia albomarginata*; 1 male, October 14, 1924, on flowers of *Gnapthalium*; and 1 female, October 30, 1924, feeding at honeydew. Other specimens studied were 1 female, Antioch, Contra Costa County, October 23, 1938 (J. W. MacSwain); 1 female, Davis, Yolo County, September 15, 1939 (G. E. Bohart); 1 female between Eureka and Weaverville, July 20, 1937 (F. X. Williams); and a series of 27 specimens from Danville and Mt. Diablo, summer of 1949 (F. X. Williams). I have also seen a male paratype (of *Niteliopsis niger* Rohwer) from Boulder, Colorado, August 4, 1908 (S. A. Rohwer), and a female paratype from Florissant, Colorado, June 12, 1908 (S. A. Rohwer), both numbered 13606, in the collection of the U. S. National Museum.

This is a subopaque, all black, or seldom nearly all black, species of rather coarse puncturation. The ocelli are arranged in about a right-angle triangle or a little less. The male clypeus bears a spikelike point, and in the female is produced into a rather narrow rounded lobe, and the clypeal carina is weak

5. Also occurring on the mainland of the United States.

or obsolete. The propodeal disc is short and a subtriangular area, usually marked by a raised line, is present (113). The aedeagus has a few rather large teeth.

Solierella nigra is closely related to *S. rohweri* (Bridwell, 1920) of the Hawaiian Islands; *rohweri*, however, has finer sculpture and the clypeal carina is usually fairly well developed; in addition, *rohweri* commonly has pale yellow markings on thorax and legs.

12. **Solierella nitens** Williams, new species

(124)

Female, holotype: Length 4.75. Shining black; sculpture and punctuation fine; clypeus and mandibles reddish apically; mandibles for basal two-thirds, two wide spots on posterior margin of pronotum, pronotal lobes, tegulae in part, disc of postscutellum, apex of femora 1 and 2 obliquely from beneath, creamy yellowish white. All tibiae with a yellowish stripe exteriorly; tarsi brown, darker apically; apex of abdominal segments testaceous. Clypeus broadly produced, slightly angulate laterad and slightly rounded out lobiform mesad (124), the margin smooth and polished, the disc gently convex, not depressed apically and with a low basal carina; ocelli in slightly less than a right-angle triangle; a weak furrow from anterior ocellus forward; antennae slender, segments 3 and 4 subequal; pronotum slightly depressed mesad posteriorly; a shining glabrous spot below wing base; disc of propodeum with the well-formed U enclosure reticulate, with a median carina and some short ones diverging from base, pleura shining and with fine well-spaced longitudinal striae, the posterior face with transverse wrinkles and a median groove widening above. Abdomen shining, impunctate. Transverse-median a little basad of basal vein. Vestiture: rather sparse silvery pile.

Holotype, female (C. A. S. No. 6167) in good condition from **Menlo Park, California**, July 13, 1937 (F. X. Williams). Paratype 1 female, Menlo Park, July 8, 1937 (F. X. Williams). In the paratype the propodeum is more finely reticulate and the transverse-median and basal veins are interstitial.

A finely polished insect, the dorsulum very finely punctate. Best identified by the clypeus.

13. **Solierella clypeata** Williams, new species

(Text figure 1)

Female, holotype: Length 4 mm. Black; head and thorax only moderately shining, propodeum subopaque, abdomen shining; puncturation fine; clypeus and mandibles reddish apically; basal part of mandibles mostly creamy yellow; two wide spots on posterior part of pronotum, pronotal lobes, tegulae, and

axillary sclerites in part, disc of postscutellum, apex of femora 1 and 2 obliquely from beneath, and a stripe on all tibiae, creamy yellowish white. Tarsi dull brownish, femur 3 with a trace of pale markings apically. Clypeus not carinate, nearly squarely truncate for its median portion, in profile convex though slightly and narrowly depressed apically, disc with a some-

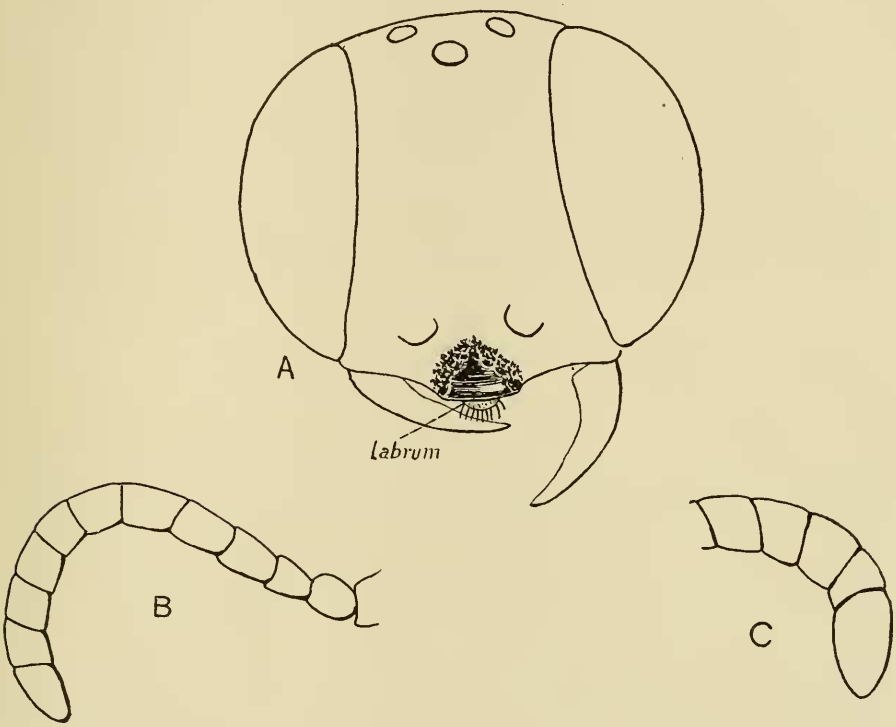

Fig. 1. *Solierella clypeata*. Clypeus and antenna of the holotype, a female from Riverside, California. At right, terminal segments of antenna of a male from Mt. Diablo, California.

what obcuneate, nearly impunctate smooth area; mandibles rather slender, not notched beneath; face only slightly gibbous; ocelli forming slightly more than an equilateral triangle, a depressed line from anterior ocellus forward; antennae moderately stout; frons very finely granulate-punctate, the vertex with fine close puncturation; no bare shining mesopleural spot; disc of propodeum finely granulate and with evidence of fine transverse striae apically, a fine raised median line, no enclosed U-shaped area, pleura shining, finely striate-reticulate, posterior face with some transverse wrinkles, a median cleft and a depression widening above. Anterior tarsi with short spines, no comb; posterior coxae with the inner carina forming an inconspicuous tooth at base.

Transverse-median basad of basal vein; first recurrent from near apex of first submarginal cell. Abdomen very finely and closely punctate. Vestiture: moderate silvery pile.

Holotype, female (Citrus Experiment Station, Riverside) in fine condition, **Riverside, California**, September 15, 1942 (P. H. Timberlake); on *Eremocarpus setigerus* (Euphorbiaceae). Other specimens: 1 female, Mt. Diablo, Contra Costa County, California, June 14, 1949, at 2000 ft., 1 male, same locality, June 23, 1949, and 2 males, same locality, August 23, 1949 (F. X. Williams). The male resembles the female in markings, sculpture and truncate clypeus, the malar space is about one-third the basal diameter of the mandibles, while the terminal segment of the antenna is the shortest for the group having this segment elongate, since in *clypeata* it is about equal in length to segments 11 plus 12 (Text fig. 1).

The Mt. Diablo specimens are not part of the type series.

14. **Solierella arcuata** Williams, new species
(115, 116, 138, 140, 147, 182)

Female, holotype: Length 5 mm. Black; head subopaque, dorsulum shining, propodeum opaque above; mandibles pale yellow at base, clypeus reddish apically; femora largely brownish black; two wide spots on pronotum, the lobes, tegulae and axillary sclerites in part, postscutellum, a widening stripe on the four anterior femora from apical half beneath to apex above, extreme apex of posterior femora, and all the tibiae dorsally, creamy yellow. Tarsi brownish. Clypeus widely arched-subconic, smooth apically, with an imperfect row of strong premarginal punctures and a low and obscure basal carina; mandibles not excised (182); frons finely granulate; ocelli in a little less than a right-angle triangle, the lateral ocelli 1½ times their diameter from the eye margin; antennae rather slender, segments 3 and 4 subequal, the apical segment at least twice as long as its diameter. Dorsulum finely and densely punctate; mesopleural spot beneath wing base finely punctate, or sometimes absent; disc of propodeum dullish, reticulate, mesad somewhat depressed troughlike apically, median carina poorly developed; sides of propodeum shining, with some 8-10 well-spaced longitudinal striae; posterior face shining, with well-spaced cross wrinkles and a narrow median cleft. Transverse-median basad of basal vein, first recurrent vein from apex of first submarginal. Vestiture; rather sparse silvery pile; some pale spines on mid-tibiae.

Male, allotype: Length 3.5 mm. Clypeus produced conelike; last antennal segment a little longer than the 4 preceding combined; ocelli more nearly approaching an equilateral triangle; last visible ventral segment with apical part rather broad, emerging from sloping shoulders; aedeagus with about

10 teeth. In markings, it differs from the female in having all the tarsi creamy yellow with the apices dusky.

Holotype, female (C. A. S. No. 6168) and *allotype* male (C. A. S. No. 6169), both from **Menlo Park, San Mateo County, California**, July 13, 1937 (F. X. Williams). Paratypes: 6 females and 1 male, Menlo Park, July 6, August 1937; 1 female, San Rafael, Marin County, July 28, 1922; 1 female, Manor, Marin County, July 28, 1937; 1 female, Redwood City, San Mateo County, June 27, 1922; 2 females and 2 males, Buck's, Plumas County, July 23, 1937; 1 female, Tahoe, Placer County, July 1925; and 6 females and 5 males, Mt. Diablo and Danville, Contra Costa County, summer of 1949 (F. X. Williams).

Solierella arcuata is one of a small group of closely related species that have the clypeus broadly arched-subconic in the female and conic in the male, and with the propodeum lacking a margined U-shaped area.

15. **Solierella australis** Williams, new species

(101, 103, 130, 137, 139, 149, 150)

Female, holotype: Length 4 mm. Much resembling *arcuata* in its arched clypeus and markings. It differs as follows: generally less shining; antennae stouter (compare 137-140); tibiae of male and tarsi of female brownish; sides of propodeum subopaque, sculptured with *many* fine close parallel striae (instead of 8-10 in *arcuata*), posterior face subopaque, the wrinkles less marked. The pilosity is also denser than in *arcuata*, so that there is no smooth shining mesopleural spot, and the disc of the propodeum may bear rudiments of a U-shaped carina.

Male, allotype: Differs similarly from the male *arcuata,* in being more pilose, duller, antennae shorter, and in the sculpture of the propodeum. The last visible ventral segment as in *arcuata*; aedeagal lobes with about 5-9 teeth. The transverse-median is slightly basad of basal vein.

Holotype, female (Citrus Experiment Station, Riverside) from **Riverside, California**, May 13, 1927, on *Euphorbia albomarginata*; *allotype* male, topotypical, May 25, 1926, at flowers of *Chorizanthe*; paratypes and all other specimens are from Riverside, with the following additional data: 9 female and 11 male paratypes, May 8, 16, 22 and 25, 1925, on *Euphorbia albomarginata*; 2 females, May 18, 1926; 1 female, June 11, 1926, on *Hugelia virgata*; 1 female, June 17, 1930, on *Hugelia virgata*; 1 female, May 18, 1933, on ground; other specimens: 12 males, May 8, 11, 18, 22 and 25, 1925, on *Euphorbia albomarginata*; 1 male, May 31, 1926; 1 male, June 11, 1926; 1 male, May 10, 1927, on *Euphorbia albomarginata*; 1 male, August 28, 1927, on *Guticrrezia californica*; 1 male, May 25, 1926, at flowers of *Chorizanthe*;

1 male, April 5, 1938, flying over ground; 1 male, May 3, 1926, on bare ground; and 1 female, September 14, 1925, on *Gutierrezia californica*; also 1 specimen, Mill Creek, San Bernardino Mts., and 1 female, Lovejoy Buttes, Mojave Desert, California, May 11, 1944, on *Pectocarya penicillata* (Boraginaceae). All specimens collected by P. H. Timberlake.

There is considerable variation in this large series, particularly in the males, and there may be two species involved. The chief variation is in the male clypeus. The fine close striation of the propodeal pleura seems to be a constant character, as nearly always, the lack of a propodeal enclosure. From *blaisdelli*, doubtful specimens may be separated chiefly by the whitish instead of the reddish mandibles.

16. **Solierella timberlakei** Williams, new species

(119)

Female, holotype: Length 3.75 mm. Black, moderately shining, clypeus largely reddish, antennae dull brownish beneath for about basal half, apex of segment 1 with yellowish brown, mandibles creamy white, becoming reddish apically; two wide spots on pronotum, portion of lobes, tegulae, axillary sclerites, and costal border of wing in part, postscutellum, the four anterior femora from apical half beneath obliquely to apex above, the very apex of hind femora, a stripe on all tibiae, and the first segment of the middle and posterior tarsi above, creamy white; rest of tarsi brownish; tibiae reddish brown beneath. Clypeus with the disc gibbous, not carinate, shining, with a few large punctures except on the steep, somewhat flattened apical slope, broadly rounded-subtruncate, very slightly emarginate mesad along the wide marginal strip; mandibles not notched beneath, hardly emarginate; antennae moderately stout, the segments thick, the apical one about twice as long as wide at base; ocelli forming a slightly greater than equilateral triangle; frons rather protruding, finely granulate, vertex finely and closely punctate except for a shining area on outer side of posterior ocelli. Pronotum slightly notched mesad; scutum and scutellum deeply and closely punctate; no shining glabrous spot above pit on mesepimeron; metapleura smooth and shining, with a few fine striae; disc of propodeum subopaque, finely reticulate, with short diverging basal striae, traces of transverse striae apically and a weak longitudinal carina, the pleura shining, finely and rather closely striate, the posterior face with an oval depression and some transverse wrinkles. Middle femora with a few short pale bristles. First recurrent entering first submarginal cell near apex, second recurrent entering second submarginal cell somewhat beyond middle; transverse-median basad of basal vein. Pygidial area polished, with fine shallow, well-separated punctures. Vestiture: rather dense silvery pubescence.

Holotype, female (Citrus Experiment Station, Riverside) in fresh condition, the clypeus being quite unworn. **Six miles south of Palm Springs, Colorado Desert, California,** June 8, 1930 (P. H. Timberlake), on *Eriogonum trichopodum*.

Named for P. H. Timberlake whose careful collecting has brought to light many new species of insects.

A distinct species.

17. **Solierella abdominalis** Williams, new species

(117, 118, 131, 133, 134, 152)

Female, holotype: Length 4.5 mm. Black; head and thorax subopaque, mandibles creamy yellow, becoming reddish apically, clypeus more or less reddish; two wide spots on pronotum, the tegulae, axillary sclerites in part, postscutellum, the four anterior femora with an oblique stripe for more than apical half beneath to apex above, extreme apex of hind femora, all tibiae above, creamy yellow. Tibiae beneath in part and the tarsi reddish brown, apical tarsal segment darker, abdomen red with a basal dark spot on tergite 2, the 3 apical tergites and sternite 3 in part, dark brown; wing veins pale at base. Mandibles somewhat emarginate beneath (about as in 142); clypeus broadly arched-subconic, as in *arcuata*, not carinate, shining, with a few large punctures beyond base, the marginal area smooth and fairly wide; antennae rather stout, last segment about twice as long as thick; ocelli forming a triangle slightly less than right angled; frons and vertex finely granulate-punctate. Scutum and scutellum finely and closely punctate; no shining mesopleural spot; disc of propodeum finely reticulate, without a bounding U-shaped carinate line, the delicate median carina in a shallow trough, some basal radiating striae, the pleura subopaque with fine separate parallel striae, the posterior face with an inverted tear-shaped depression and some meshlike transverse wrinkles. A few pale bristles on midtibiae. Venation as in *timberlakei*. Abdomen with the segments hardly depressed apically; pygidial area finely punctate, densely so at sides. Vestiture: moderate silvery pile.

Male, allotype: Length 3.75 mm. Marked like the female, but the last antennal segment dull reddish brown, fore coxae beneath chiefly yellow, apex of abdomen blackish above. Clypeus as in *arcuata* and *australis*, the apical portion not punctate; last antennal segment about as long as the 5 preceding together; ocelli in an obtuse though more nearly equilateral triangle; no line from anterior ocellus posteriorly. Aedeagus with 7-8 teeth.

Holotype female (Citrus Experiment Station, Riverside) in fresh condition; from **Palm Springs, California**, May 11, 1935 (P. H. Timberlake), on

Euphorbia polycarpa. Allotype male, topotypical, March 26, 1932, on *Malva pusilla.* A third specimen is from Kyle Canyon, Nevada (P. H. Timberlake).

Differs from *timberlakei* in the finer and denser puncturation of the head, the more rounded clypeus with its narrower margin, and in the somewhat emarginate mandibles, while the ocelli of *abdominalis* and of the following closely related species (*S. bicolor*) are arranged in an approximately right-angle triangle and slightly more obtuse than in *timberlakei.*

18. **Solierella bicolor** Williams, new species
(132, and text figure 2)

Female, holotype: Length 4.75 mm. Black; head and thorax subopaque; the creamy yellow markings, mandibular and clypeal colors are as in *abdominalis*; tergites 1, 2, and 3, except the dark middle portion, reddish, segments 4 and 5 brownish black, pygidium dark reddish brown, sternites mainly reddish, the 3rd with a dusky suffusion; apical margin of segments testaceous; legs except for the pale markings largely reddish brown. The only differences

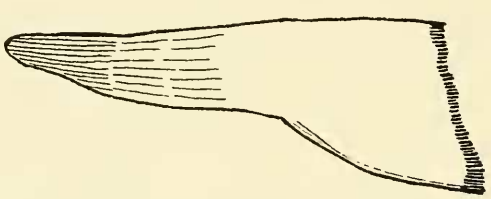

Fig. 2. *Solierella bicolor* ? Mandible of male as seen from the outer side. Specimen from Palm Springs, California.

I find between *bicolor* and *abdominalis* are: *bicolor* has the abdomen more solidly dark reddish brown to brownish black; there is no definite though finely impressed line from anterior ocellus posteriad, as in the *abdominalis* female; the clypeus in *bicolor* has the disc more strongly punctate, the close punctures extending closer to the margin, thus leaving a smaller median and lateral impunctate area (as in *S. arcuata* and *australis*); in *bicolor* the antennae are definitely stouter and shorter, the last segment being slightly less than twice its thickness.

Holotype female (Citrus Experiment Station, Riverside) from **Riverside, California,** April 25, 1929, "flying low over the ground" (P. H. Timberlake). Paratypes: 4 females in good condition, 2 from Riverside, April 21, 1938, and April 15, 1939, "flying over ground"; 1, Riverside, April 16, 1928, "on ground"; 1, one and one-half miles west of Perris, Riverside County, on *Salvia columbariae,* April 27, 1938 (P. H. Timberlake). Also 3 females, The Gavilan, near Riverside (P. H. Timberlake).

What may be the male of this species is represented by a single specimen taken in fresh condition by Mr. Timberlake, at Palm Springs, May 6, 1946, on *Euphorbia polycarpa*. The description follows: Length 3.6 mm. Black; head, thorax, and abdomen not very shining; mandibles creamy yellow becoming reddish apically; fore coxae in part beneath, two wide pronotal marks, lobes in part, tegulae and axillary sclerites, the four anterior femora beneath from apex to near basal third, posterior femora apically, all tibiae except a dark stripe beneath, the tarsi except the reddish brown apical segment, and the postscutellum, creamy yellow; apex of tergites more or less widely testaceous. Head and thorax very finely punctate and granulate, the abdomen very finely reticulate. Mandibles somewhat excavate beneath (text figure 2), malar space ½ to ⅓ basal diameter; clypeus produced about as in *abdominalis*, slightly upturned at apex, the apical portion with some large punctures; ocelli forming very slightly more than an equilateral triangle, an ill-defined impressed line from anterior ocellus posteriad; antennae subclavate, the last segment approximately equalling the preceding five. No shining mesopleural spot. Disc of propodeum not enclosed by a raised line, reticulate and with a delicate median carina, the pleura shining, with well spaced parallel carinulae, posterior face transversely carinulate and with an inverted tear-shaped depression.

19. **Solierella levis** Williams, new species

(121, 142, 178)

Female, holotype: Length 3.8 mm. Black; head, thorax, and abdomen shining; puncturation fine; mandibles yellowish brown near the middle, clypeus largely dark reddish; two wide spots on posterior part of pronotum, the lobes narrowly, postscutellum, four anterior femora apically to postero-ventrad, a stripe on the posterior tibiae above, creamy white; tarsi brown; apical margin of abdominal segments testaceous. Mandibles slightly notched beneath toward base (142), clypeus not carinate, broadly subtruncately produced, depressed toward margin to form a rather wide smooth rim, the disc shining, with a few strong punctures; antennae rather slender, slightly clavate, segments 3 and 4 subequal; ocelli forming a triangle slightly greater than an equilateral triangle; a furrow forward from anterior ocellus; front and vertex very finely reticulate (close shallow punctures). Scutum and scutellum finely and closely punctate, a rather shining though punctate spot on mesopleura; disc of propodeum without bounding enclosure, reticulate, with a rather weak median carina, the sides of posterior face shining, with transverse wrinkles, those of the posterior face few and widely spaced, the posterior depression subtriangular. Outer spines of fore tarsi equalling to surpassing the diameter of their respective segments. Transverse-median basad of basal vein. Abdomi-

nal segments very slightly depressed apically; pygidium with some fine scattered punctures, subaciculate above the marginal pilose boundary.

Holotype female (C. A. S. No. 6170) from **Emeryville, Alameda County, California**, October 26, 1938 (J. W. MacSwain). Four female paratypes and same data. Two of the paratypes have a well-marked U-shaped enclosure on the disc of the propodeum. Additional speciments: one female from Cathedral City, California, October 8, 1945 (P. H. Timberlake), "entering hole in sand." This specimen is peculiar in that it has but two submarginal cells, the distal side of the second submarginal being absent.

A smooth shining species with sparse vestiture and somewhat resembling *S. nitens*, but differentiated by the shape of the clypeus and the brownish ground color of the mandibles, and by the gently notched or excavate mandibles.

20. **Solierella bridwelli** Williams, new species

(122, 123, 135, 136, 145, 153)

Female, holotype: Length 3.5 mm. Black; mandibles creamy white at wide basal portion, thence yellowish and then brown apically, legs deep brown to black. Pale markings as follows: two wide pronotal spots, the lobes, tegulae, axillary sclerites in part, postscutellum, stripe on four anterior femora beneath for more than apical half to apex above, apex of hind femora beneath, all the tibiae above and the first segment of all tarsi, creamy white; other tarsal segments becoming darker, costa and subcosta at base creamy to pale brown; apical margin of abdominal segments testaceous, venter particularly at base largely obscure brownish. Mandibles rather slender and more emarginate than usual (135); clypeus broadly rounded out, with a wide smooth margin very slightly depressed and emarginate mesad, the disc itself broadly depressed in a procurve before the middle length, smooth and shining, excavate in profile, with a very few large punctures; antennae short and stout, the last segment a good deal longer than the preceding one; frons subopaque, very finely granulate, vertex shining and very finely and closely punctate; ocelli forming a triangle only slightly greater than equilateral. Pronotum slightly notched mesad; dorsulum shining, very finely and closely punctate; no smooth shining mesopleural spot, the area all covered with sericeous pile; disc of propodeum opaque and finely reticulate, no U-shaped bounding line, some fine oblique wrinkles and a median carina in a shallow trough; pleura very finely reticulate-striate, the posterior face with some transverse wrinkles and a shallow triangular depression. First and second submarginal cell each receiving a recurrent vein, the second recurrent entering near apex of cell; transverse-median well basad of basal vein. Disc of pygidium finely and closely punctate. Some pale bristles on meso- and metatibiae. Vestiture: rather dense silvery pile.

Male, allotype: Length 3.5 mm. Marked as in female, but the sculpture is coarser, the clypeus more convex and shining for a shorter portion, and arcuate subconic mesad (123); the mandibles are more strongly excavate; antennae mainly brownish, the last segment being equal to about the preceding 5½; malar space about as long as ½ the width of the mandibles at base (practically no malar space in the female). Disc of propodeum with a faint median carina, some basal fanning-out wrinkles and some transverse ones; posterior face with transverse wrinkles and a strong triangular depression. Carinal tooth on posterior coxae at base obtuse, blunter than in *S. blaisdelli* (110). Lobes of aedeagus rather high, with 5 teeth each.

Holotype female (Citrus Experiment Station, Riverside) in fresh condition from **10 miles south of Adelante, Mojave Desert, California**, May 28, 1932, on *Chorizanthe thurberi*. *Allotype* male from 5 miles south of Palm Springs, Colorado Desert, June 8, 1930, "in shade of *Dicoria*." Paratypes: 1 female, Riverside, July 5, 1929, on *Eriogonum gracile*; 1 female, Yermo, Mojave Desert, June 19, 1939, on *Eriogonum reniforme*. All collected by P. H. Timberlake.

A thickset species, particularly the female. The mandibles in both sexes are more emarginate than usual, except in *S. albipes* (Ashmead). One of the paratypes being quite freshly developed still shows a good deal of brownish ventrad.

Named for J. C. Bridwell, who has described several species of *Solierella* and has done excellent work among the Hymenoptera.

21. Solierella albipes (Ashmead)

(125-129, 146, 151, 179, 187)

Plenoculus albipes, Ashmead, 1899, Psyche 8:338-339. Male. Rifle, Colorado.

Solierella albipes (Ashmead) Krombein, 1938, An. Ent. Soc. Amer., 31:469.

A small series of *Solierella* from San Mateo County and the Sierra Nevada, and a larger series from southern California seem to belong here. A female collected by the writer in Pueblo, Colorado, August 4, 1922, is probably the undescribed female of *albipes*. The males from central California have the clypeus more or less acutely produced (125); those taken by Timberlake in southern California have the clypeus terminating in an inconspicuous nipple (129). In addition, the two males from central California have a mucro on the fore femora beneath (as in some males of *blaisdelli*). Timberlake's specimens are the most strongly marked with creamy yellow and to that extent better conform to Ashmead's description. Comparison of Californian specimens with those at the U. S. National Museum indicate their probable identity with this apparently variable species.

The following is a description of this species from southern California: Female: Length 3.75 mm. Black; mandibles creamy white at base, clypeus in part reddish brown; two wide pronotal spots, pronotal lobes, tegulae and axillary sclerites in part, and postscutellum, creamy white; legs largely dark brown with the anterior femora for more or less of the apical half beneath to apex above, the middle femora apically beneath, and all the tibiae above, creamy white. Clypeus broadly rounded subtruncate with a rather wide smooth margin, the convex disc shining for more than its apical half and with large sparse punctures; mandibles emarginate beneath (127); antennae moderately slender, subclavate, the last segment about twice as long as thick and one-third longer than penultimate segment; ocelli in somewhat less than a right-angle triangle; frons subopaque, very finely granulate, vertex shining and with fine close punctures. Scutum and scutellum shining, with fine close punctures; a shining mesopleural spot; disc of propodeum subopaque, without a well-margined enclosure, and with a fine incomplete carina and basal and transverse carinulae, sides subshining with fine well-separated wrinkles, posterior face with the usual wrinkles and median depression. A few pale bristles on middle and posterior tibiae. Abdomen shining; pygidium with fine separate punctures. Moderate silvery pile.

Male: Length 2.9-3.6 mm. Marked like the female, with the addition that the first four segments of all tarsi are creamy yellow, the fifth segment becoming dusky. The clypeus is subconic in outline with an apical nipple. The terminal segment of the antennae is about equal to the sum of the four preceding ones. There is usually a shining mesopleural spot. The disc of the propodeum is rather coarsely reticulate and has a median carina.

Three females and 1 male, Riverside, September 9, 1924, May 4, 1925, June 16, 1925, and September 23, 1934; all on *Euphorbia albomarginata*; 1 female and 4 males, Whittier, August 1920, in river bottom, at glands of *Helianthus*. Additional specimens: 1 female, Camp Pendleton, April 23, 1946, flying over ground, and 1 male, Palm Springs, May 6, 1946, on *Euphorbia polycarpa* (P. H. Timberlake).

22. **Solierella sayi** (Rohwer)

(56, 155-166, 168, 169, 173, 177, 180)

Niteliopsis sayi Rohwer, 1909, Trans. Amer. Ent. Soc., 35:114-115. Male and female. "Habitat, Florissant, Colorado, June 19, 1908 (S. A. Rohwer). Caught while flying over sandy soil in a dry creek bed, and under bushes of a wild gooseberry (*Ribes vallicola*).

"A very distinct species, easily recognized by the short submedian cell, and the testaceous mandibles. Dedicated to the pioneer entomologist Thomas Say."

The large series of Californian specimens taken by me chiefly on Lone Mountain, San Francisco, and in Marin, Contra Costa, and San Mateo Coun-

ties, as well as a few in the Sierra Nevada, together with a number taken by P. H. Timberlake in southern California, while presenting some slight variations in markings and form of clypeus, agree with the type specimens in the United States National Museum.

Solierella sayi, length 3.5-4.7 mm., is a finely and closely punctate species with the head and thorax opaque. Proceeding from base to apex, the mandibles are black, creamy yellow and reddish brown; the femora of the fore and middle legs apically beneath and the pronotal lobes are creamy while, although in specimens from the Sierra Nevada the femoral marks may be nearly obsolete. The antennae are rather slender with segment 3 distinctly shorter than 4 in both sexes and segment 13 very short. This and the following species are the only ones known to me that have the clypeus rather narrowly produced mesad, the subtruncate portion usually more or less three-lobed and the sides commonly angulate. The posterior ocelli are rather more distant than usual from a line joining the posterior margin of the compound eyes at the vertex. The propodeum has no bounding carina and the pygidium is broad and finely reticulate.

The specimens collected by Timberlake bear the following data: two males and 1 female, Yerba Linda, August 14 and 15, 1920, on *Euphorbia albomarginata*; 3 males and 3 females, Riverside, as follows: 1 female, July 1, on *Euphorbia albomarginata*; 1 female, September 15, 1925, on *Eriogonum gracile*; 1 male, August 2, 1929, on *Eriogonum gracile*; 1 male, September 23, 1929, on *Euphorbia albomarginata*; 1 female, April 16, 1936, "excavating nest"; 1 male, April 20, 1937, "flying over ground"; 1 male, Whittier, August 11, 1920, at glands of *Helianthus*. Six additional specimens, Riverside, June and September, 1946, were also collected by Timberlake.

23. **Solierella californica** Williams, new species

(167, 170-172, 181)

Female, holotype: Length 4 mm. Black; subopaque, abdomen shining; mandibles blackish at very base, then pale yellow, and finally reddish brown apically; pronotal lobes, four anterior femora apically beneath and posterior femora at extreme apex and a stripe on all tibiae above, whitish yellow; tarsi brown. Clypeus rather narrowly truncately produced, the angles sharp, the margin gently arched and polished well back on its relatively flat disc, antennae slender, segment 3 a little shorter than 4; frons finely punctate; ocelli forming a triangle slightly more acute than equilateral, placed well forward in relation to posterior margin of compound eyes. Mesonotum and metanotum finely and closely punctate, the mesopleura without a polished spot; disc of propodeum finely reticulate, fan-wrinkled basally in the non-carinate median trough; pleura very finely reticulate, the posterior face with some transverse

wrinkles and a shining inverted tear-shaped fovea; fore tarsus with the posterior or external bristles about as long as the width of their respective tarsal segments (18); first and second submarginal cells each receiving a recurrent vein. Pygidium rather broad, finely reticulate. Vestiture, of moderate silvery pile.

Male, allotype: Length 3.5 mm. Marked like the female. The rather narrow produced part of the clypeus bears a spinelike process; the upper frons and the vertex are narrower than in the female, and the relatively forward ocelli form a slightly more acute angle than in the female; the last antennal segment is much shorter than the preceding one. The fore trochanters as in *sayi*, are only gently excavate.

Holotype female (C. A. S. No. 6171); *allotype* male (C. A. S. No. 6172) and 2 female and 15 male paratypes, all from **Los Angeles** sand dunes, **California**, May 23, 1920 (F. X. Williams); 1 male and 1 female paratype, Whittier, August 11, 1920 (P. H. Timberlake), at glands of *Helianthus*.

An easily recognized little species.

NOTES ON THE HABITS OF SOLIERELLA

These wasps favor warm dry regions where there is enough vegetation to furnish nectar for themselves, and other insects as provender for their young. Montane species of *Solierella* usually occur in stony areas where there is not too much undergrowth, while those living close to the seashore are often found among sand dunes.

The flowers which these wasps visit are very commonly species belonging to the families Polygonaceae and Euphorbiaceae; among the former are *Eriogonum* spp., *Polygonum* (knotweeds, etc.), and *Chorizanthe*, while in the latter family, *Euphorbia albomarginata* appears to be the most favored among the *Solierella* in southern California. Other favored plants are stork's bill (*Erodium* sp., Geraniaceae), *Gutierrezia californica* and tarweed (*Hemizonia wrightii*), the last two belonging to the Compositae. The glandular stems of the sunflower (*Helianthus* sp.) also attracts these wasps. It is fitting to state here that it is due mainly to the meticulous care of Mr. P. H. Timberlake in recording the flower hosts of *Solierella*, and of other hymenopterans, as indicated in his labeling, that I have been able to secure these data.

Our knowledge of the prey of *Solierella* is very scanty, but the available data agree at least in a rough measure with the natural groupings of these wasps. Thus, the largest species belonging to group I, those of group III, and perhaps group II prey on short-horned grasshoppers; groups IV-VII store hemipterans (bugs), while in group VIII, *Solierella sayi* preys upon psocids (book-louse relatives).

These wasps show very little construction ability. They seem usually not to excavate their nest-holes, but choose for example, a deserted spider burrow, a beetle boring, or the old nest of a solitary bee in some bramble.[6] Their paralyzed prey is stored in this nest amid the various debris brought in, and the entrance to the nest is crammed with this material.

In the United States, *Solierella peckhami* (Ashmead) (= *Plenoculus peckhami*) was observed by the Peckhams in Wisconsin nesting in stems of raspberry bushes and storing them with immature bugs of the genus *Pamera* (Lygaeidae) (*Wasps, Social* and *Solitary*, 1905, on pp. 95-96. Boston and New York). In *Wasp Studies Afield*, by Phil and Nellie Rau, 1918, on pp. 134-135 (Princeton University Press), and in Field Studies in the Behavior of the Non-social Wasps, by Phil Rau (Trans. Acad. Sci. St. Louis, XXV, 1908, on pp. 375-378) there is considerable information on the biology of *Solierella nigra* (= *Silaon niger*) in Missouri.

In Europe, S. Saunders (Trans. Ent. Soc. London, 1873, on pp. 410-411) describes the genus *Niteliopsis*, at best a subgenus of *Solierella*, for *N. pisonoides* Saunders, and he describes its pupal case found in brambles and refers to its also being found (teste Giraud) nesting in trunks and branches of decayed trees. In Bul. Soc. Ent. France, 1896, on pp. 79-80, Captain Xambeu describes the early stages of *Sylaon xambeui* Andre nesting in old longicorn beetle burrows, in southern France. In Bonifacio, Corsica, Ferton found *S. compeditus* Picc., a species closely related to *S. xambeui* nesting in the ground. Both of these species prey upon immature hemipterans; in the case of *S. compeditus*, on bugs of the family Lygaeidae. Ferton found *S. xambeui* paratized by *Eupelmus geeri* Dalman and by an anthrax fly. (Bul. Ent. Soc. France, 1896:80, and An. Soc. Ent. France, LXX, 1901: 101-102).

Solierella striatipes (Ashmead)

(Text figure 3)

This is our largest species, measuring up to 11 mm. Biological data on it were obtained in the vicinity of Stanford University during the summer of 1937, and are as follows:

Menlo Park, July 7, at about 3:00 p.m., I noticed a *striatipes* searching for her prey among dry grass and particularly in little patches of bindweed (*Convolvulus arvensis*). She would creep among the bases of the plants or, flying about the green stems, would poise in air a moment as if to dart at her prey, and then would continue her search in the adjoining weed patch. She searched to perhaps a distance of 30 feet on both sides of her nest-hole which, after a fruitless hunt she would occasionally visit. Finally, at about 15

6. Those species with well-developed tarsal combs may perhaps dig their own burrows.

feet from her nest-hole she issued from a weedy area, dragging by the antennae and venter up, her relatively enormous prey, a short-horned grasshopper twice her length and several times her weight. Her progress nestwards was tedious. Straddling her victim, the third pair of legs on the sides of the grasshopper's thorax, she pulled herself along, with now and then a hop, with her first, and to a lesser extent her second pair of legs. Once,

Fig. 3. *Solierella striatipes.* Female. Taken with her prey, *Melanoplus ligneolus,* at Menlo Park, California. The grasshopper is 22 mm. long.

apparently where the grasshopper had been overcome and again, where it had been dragged to about 6 feet from her burrow, she left her prey and went to reconnoiter about her burrow. Resuming her journey she rushed headfirst with her prey into the tunnel. In less than five minutes she reappeared and briskly set to work filling up the tunnel. This was of very ample bore and in rather dry and cracked soil. It sloped steeply, although, as later revealed, was scarcely double the length of the contained grasshopper, which was 22 mm.

The wasp selected her filling material with some care. This appeared to consist chiefly of the brittle-dry leaflets of an ornamental leguminous shrub which she procured at times from a distance of several feet. Later on, small lumps of soil were also used. All this material was carried forward in the

wasp's mandibles and thus inserted into the tunnel. When the latter seemed nearly filled I captured the wasp and opened the nest-hole. The grasshopper that lay at the bottom had been so paralyzed by stinging that it could little more than move its antennae. Evidently the wasp's egg had been brushed off its body through my clumsy digging. The orthopteran proved to be a mature brachypterous female of *Melanoplus ligneolus* Scudder.

A second observation on *Solierella striatipes* was made on August 2, at Searsville Lake, back of Stanford University. By an oak tree on a dry hillside exposed to the noonday sun, one of these wasps was filling up her nest-hole. She would fly rapidly back and forth a few inches, while on the wing would drop a bit of material in the entrance, but occasionally descend with her load to enter. This hole, a smooth-walled earthen tube separable from the surrounding soil and a little more than a half inch in diameter was evidently an old trap-door spider or tarantula burrow. Two nearly immobilized melanopline grasshoppers had been stored, seemingly in a single chamber, at a depth of about two inches. They were supported on a loose core of debris that consisted of bits of oak leaves, twigs, gravel, etc., and were covered by a similar mass of material. The larger grasshopper, a fully-winged specimen was 19.6 mm. long; the smaller one, in the penultimate stage was 14.3 mm. Both were perfect specimens. The pale creamy *Solierella* egg was firmly cemented at one end, in the crotch formed by the inner base of the hind leg and the body, on the right side in one victim, and on the left in the other. It protruded upwards to bend somewhat over the venter of the first abdominal segment of the grasshopper.

In both cases the nest-holes of this wasp were quite loosely filled, affording plenty of ventilation and access, it would seem, to ants.

A little fly of the genus *Taxigramma* (Metopiidae) was captured as it hung about one of the nests, and was probably parasitic in the stored prey.

The related *Solierella fossor* (Rohwer) was taken by Rohwer in Colorado, with an immature oedipode grasshopper.

Solierella similis (Bridwell)

This species which was described from Berkeley, California, is nearly all black and measures up to about 6.5 mm. long. It also preys upon acridiid grasshoppers, selecting very small individuals about its own size, or smaller.

My first observation was made July 13, 1925, at Lagunitas, Marin County. Shortly after noon, *S. similis* was noted flying for a distance of about two feet between the ground and a broken stem some 9 inches tall, of an umbelliferous plant growing in a dry creek bed. She was evidently plugging up a cell in this comparatively large stem, disappearing out of sight in it with

a grain of soil in her mandibles, and turnng around therein when ready to fly off. On cutting open this stem the following day, it was found to be filled for nearly 3 inches with bits of soil, bark, wood, etc. At the bottom was a full-fed *S. similis* larva, with prominent lateral thoracic tubercles. In the midst of the debris were three or four tiny grasshopper nymphs, one of which bore a wasp larva on its breast. Several other nymphs were found in this more or less disturbed nest, at the recently filled extremity of which was a single nymph with a *Solierella* egg glued to the base of the abdomen and just back of the stub of the hind leg and therefore in about the same situation as that of *S. striatipes*. From this nest a single male *S. similis* was reared.

Near Lake Tahoe in the Sierra Nevada, in late July 1925, I observed this wasp and *S. vandykei,* which resembles it. One of these two species was found to have habits as recounted above. The tunnel in this case was a beetle boring in the bark of a giant dead conifer that lay along the ground. The wasp had stuffed the tunnel with debris, among which lay its paralyzed victims—three very young short-horned grasshoppers, one of which bore the delicate wasp egg glued near the base of one hind leg and extending obliquely across the breast.

At Menlo Park, San Mateo County, during late July 1937, several *Solierella similis* were observed hunting in an almost bare and somewhat burnt-over field. They made brisk, short-distance flights, to alight and run a little, and to examine and hover about plant stems. Prey was scarce. I caught two of these wasps and enclosed them in a glass tube with a very young short-horned grasshopper. One of these wasps quickly pounced upon the orthopteran and, curving her abdomen under her prey soon stung it to passivity. Shortly thereafter she grasped the base of the grasshopper's antennae in her jaws and carrying her prey venter up hopped about the tube.

Solierella corizi Williams

This seems to be the largest of our bug-catching *Solierella,* females attaining a length of 8 mm. It is prettily adorned with creamy white or yellowish markings and fine silky vestiture. The scene of its observed activities lay chiefly in a small area of hard, sun-baked soil in the yard of my sister's residence at Menlo Park, and I am thankful that here as elsewhere, waste places are to be found on properties favorable to wasp life. In this little piece of land, so conveniently situated, I made many observations not only on the genus

Solierella, but on *Diploplectron* and *Astata.* During late July and early August 1937, several female *S. corizi* were seen flying in an erratic manner hardly an inch above the ground, winding among the sparse dwarf weeds and grass, now stopping to feed at the pink *Erodium* flowers or those of a mat knotweed (*Polygonum* sp.), else alighting to rest or to sun themselves, or again, to examine one or several holes. It appeared that the wasp uses—sometimes more than once—burrows made by other creatures. On leaving a burrow the wasp hovers about it in gentle curves—the so-called "locality study." And in filling or opening the tunnel, soil or other debris is seized in the mandibles—with the possible aid of the forefeet—and carried to or from the hole on the wing, the wasp seeming always to face the hole, this operation recalling that of *Belomicrus franciscanus* Pate, a little oxybeline wasp studied by the writer in San Francisco (Pan-Pacific Entomologist, XII, 1936, on pp. 3-6). Provender appeared to be scarce. On July 31, during the heat of the day, a wasp was observed storing her nest-hole with young bugs. Carrying her prey venter up beneath her she squeezed into the entrance with hardly a pause. But a bug that was too large to be thus hurried inside had to be carried somewhat behind the wasp, with a second pull to draw it wholly inside the tunnel.

The first stored tunnel examined was between 2½ and 3½ inches long. It was quite steep and contained 3 cells with contents as follows: in the first or uppermost were four immature *Corizus hyalinus* (Fabr.)[7] bugs, of which at least two were still able to twitch the tarsi. Transversely across the throat of one of these bugs and not quite reaching the fore coxae and crossed above by the bug's beak was the rather stout curved glassy white wasp egg. The second cell, separated from the first by the usual debris, contained two immature and one mature *Corizus hyalinus,* one of the former bearing the egg; in addition this cell contained a broad immature pentatomid bug, probably *Perilabus abbreviatus* (Uhl), apparently in the antepenultimate stage. The third cell contained four, apparently penultimate stage *Corizus hyalinus,* one bearing the wasp's egg.

A second nest-hole contained two cells separated by debris. The top cell revealed a wasp grub in the act of forming its cocoon cask, there being a wet ring of earth about itself. Somewhere below was a crushed young *Corizus* bug, and one hatched *Solierella* cocoon.

7. The bugs were determined by E. P. Van Duzee, then Curator of Entomology at the California Academy of Sciences.

At Manor, Marin Co., July 28, 1937, a *Solierella corizi* was observed filling her tunnel, gathering small particles from a bare area some 5-6 ft. away. These trips were made in flight. At first she disappeared well down her tunnel; eventually, however, as it filled up she often dropped small particles in or at the entrance. I tried digging out the smooth vertical tunnel, which I suspect had belonged to a spider, but without success.

While in Kansas in 1912, the writer was able to study a little of the nesting habits of *Solierella inerme* Cresson, or of a species closely related to it. This wasp, which belongs to the same section as *S. corizi*, stored her tunnel, apparently an abandoned spider domicile, with immature green capsid bugs.

Solierella nigra (Ashmead) and **Solierella blaisdelli** (Bridwell)

In the middle of July 1937, these two species were not uncommon at Menlo Park, where they often occurred intermixed. A note of July 18 is as follows: In an area about 5 feet square both of these little wasps were observed preying on *Nysius ericae minutus* Uhler, a small bug that as both young and adults almost seethed with abundance among the low battened down and largely dry vegetation. So quickly did the wasps move about, seize their prey, and take off that they were difficult to bottle. However, I succeeded in catching several of these wasps with their prey, in all cases immature. I concluded at the time that these *Solierella* nested in the ground.

Rau has made observations on *S. nigra* in Missouri (*Wasp Studies Afield*, pp. 134-135, 1918. Princeton Univ. Press; and "Field Studies in the Behavior of the Non-Social Wasps," Trans. Acad. Sci. St. Louis, XXV, No. 9, on pp. 375-378, 1928). He found that it nested in hollow woody stems and had little architectural ability, to wit: "*S. niger* does not make either partitions or cells in this burrow, but merely fills up the tunnel from bottom to top with bits of any material that she finds convenient, with her eggs and provisions scattered along at intervals in the mass." Rau says further: "The parasites *Cleptes* sp. (S. A. Rohwer), *Ellampus* sp. (S. A. Rohwer), and *Chrysis* sp. emerged from the nests of *S. niger*."

Solierella rohweri was described by Bridwell (Proc. Hawaiian Ent. Soc., IV, pp. 398-399, 1920) from the Hawaiian Islands. He found it nesting in dead twigs of a species of *Euphorbia* and using *Nysius* bugs as provender. In VI, 1926, of the same Proceedings, I gave further details of the biology of this species. This wasp which is widely distributed in the lowlands of the

Hawaiian Islands may often be observed at the flowers of *Euphorbia* weeds, such as *E. hirta* L., or seeking its prey, as also does the wasp *Astata immigrans* Williams, on purslane (*Portulaca oleracea* L.) that harbors the desired *Nysius* bugs.

Solierella nitens Williams

I have seen but two examples of this small shining black wasp. Both are from Menlo Park. One of these specimens was observed in 1937 filling its nest-hole in the ground with fine particles of debris, the wasp dropping this material while in flight.

Solierella sayi (Rohwer)

This little wasp was described from Colorado. It is common in San Francisco, where my scant observations on it were confined chiefly to Lone Mountain, a sandy hillock, once the writer's favorite collecting ground. On the southern exposure of this hill, *S. sayi* was often seen basking in the sunshine or, in nervous haste, examining dead twigs near the ground, fine debris, crannies, and other likely places for its prey which consists of psocids.

On June 21, 1922, two of these wasps were observed carrying well under their bodies a species of winged, fat-bodied psocid. This prey seemed to be carried by the antennae, the burdened wasps hopping along and making short sailing flights nestwards. Similarly in 1925, and again in 1930, a wasp was seen carrying the same species of psocid, which was determined by Mr. Nathan Banks as *Psocus californicus* Banks. In 1925, one of these wasps was observed plunging into her nest-hole in the sand. The tunnel measured three inches long and was stored with small psocids which Mr. Banks regards as probably the male of *Lepidilla kelloggi* Ribago. In this case the wasp's eggs were fastened transversely between the first and second pairs of legs of the prey. The eggs were curved, with the free end extending beyond the thorax of the psocid.

PLATE 11

Fig. 1. *Solierella striatipes.* Female. Head. A, clypeal profile.
Fig. 2. Same. Male. Head. B, clypeus and mandible in profile.
Fig. 3. Same. Female. Antenna.
Fig. 4. Same. Male. Posterior coxa from side. C, carinal crest.
Fig. 5. Same. Male. Fore coxa and trochanter from side.
Fig. 6. Same. Male. Antenna.
Fig. 7. Same. Male. Aberrant venation.
Fig. 8. Same. Male. Aberrant venation.
Fig. 9. Same. Female. Aberrant venation.
Fig. 10. Same. Male. Wings, showing normal venation.

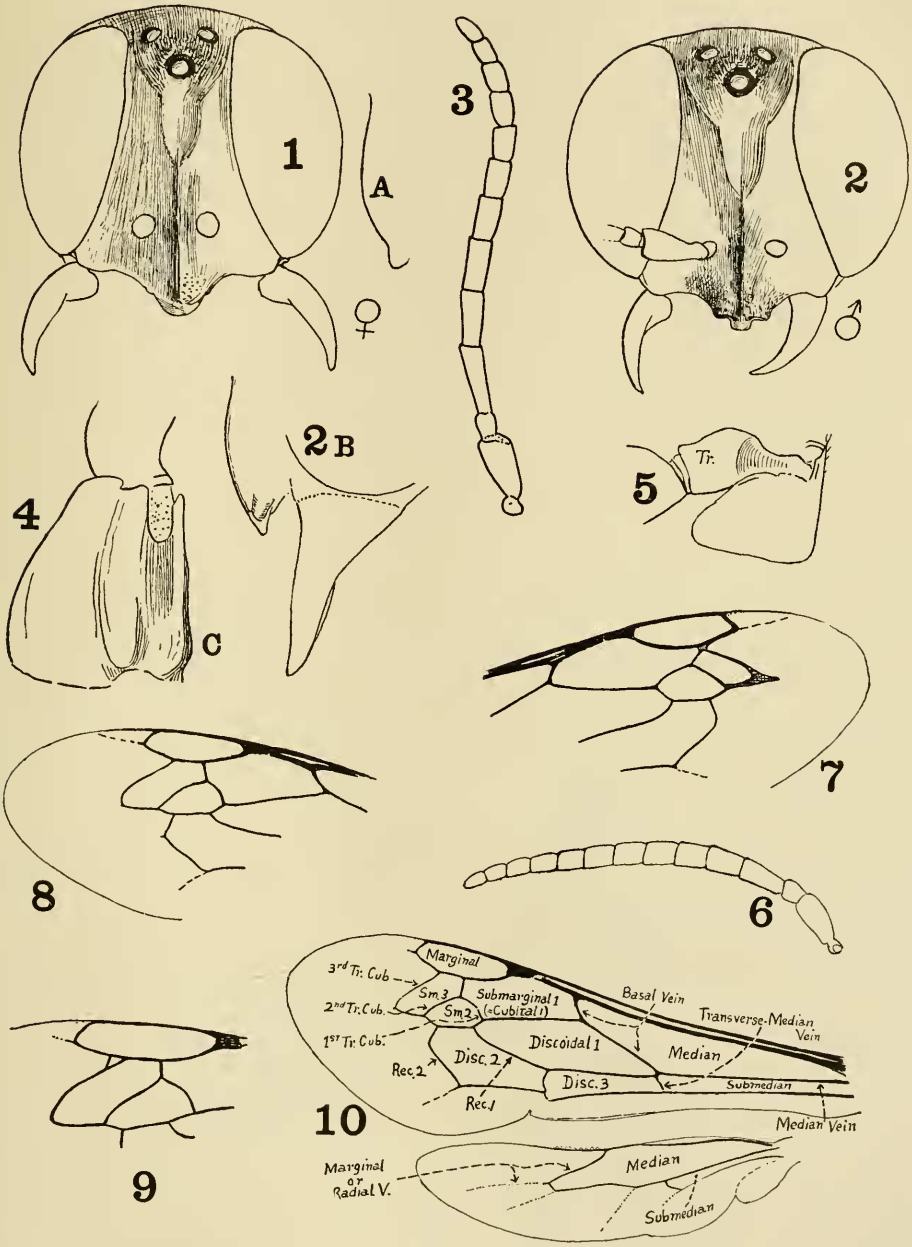
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PLATE 12

Fig. 11. *Solierella striatipes.* Male. Propodeum, showing the more usual sculpture as seen from above.
Fig. 12. Same. Male. Propodeum, showing occasional sculpture as seen from above.
Fig. 13. Same. Female. Ocelli.
Fig. 14. Same. Male. Aedeagus and lateral lobes.
Fig. 15. Same. Male. Aedeagal lobe from above, more enlarged.
Fig. 16. Same. Male. Last visible ventral segment.
Fig. 17. *Solierella major.* Female. C, clypeal profile. From San Diego, California.
Fig. 18. Same. Female. Antennal segments 3 and 4.
Fig. 19. *Solierella boharti.* Female. Disc of propodeum.
Fig. 20. Same. Female. Ocelli.
Fig. 21. Same. Female. Head. C, clypeal profile.
Fig. 22. Same. Female. Antennal segments 1-4.

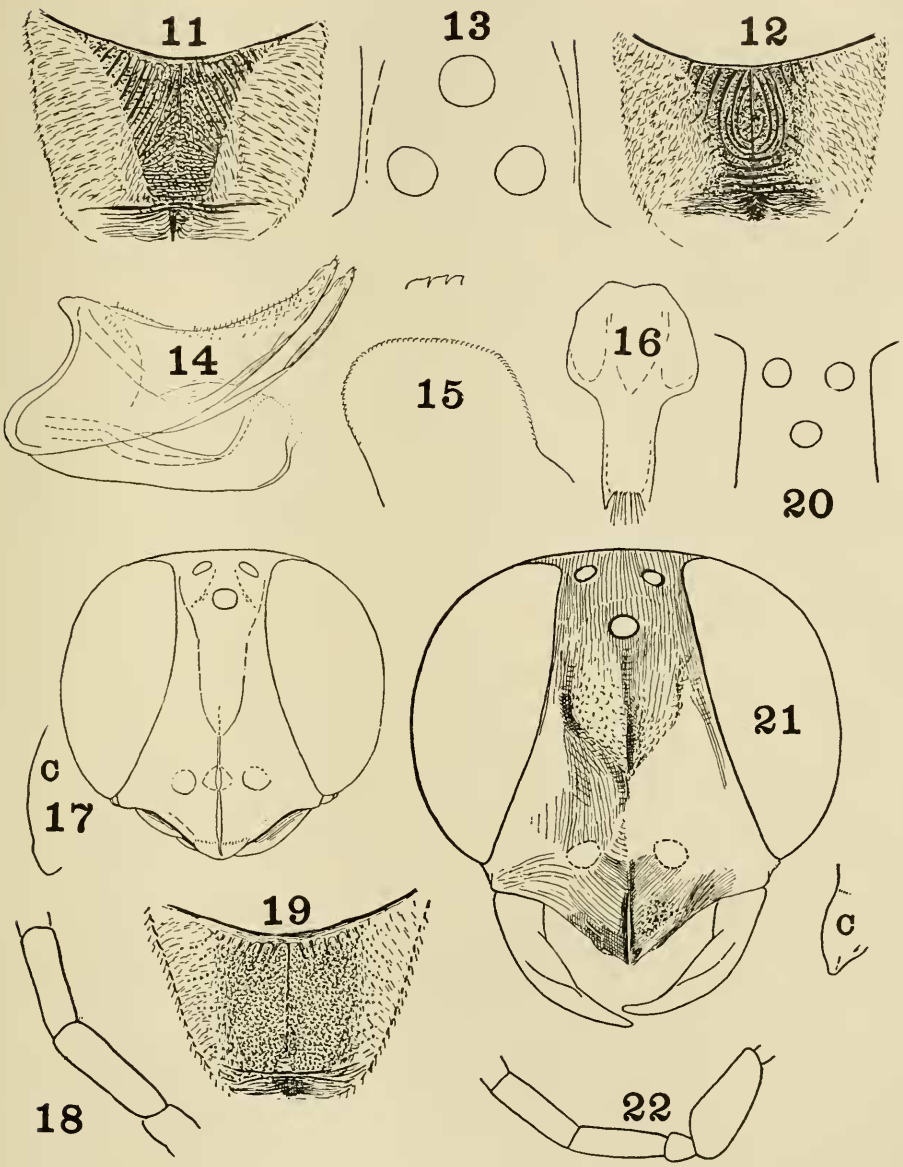
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PLATE 13

Fig. 23. *Solierella lasseni.* Female. C, clypeal outline of type.
Fig. 24. *Solierella sonorae.* Female. Ocelli.
Fig. 25. *Solierella lasseni.* Female. Mandible, from side.
Fig. 26. Same. Female antenna.
Fig. 27. *Solierella sonorae.* Female. Posterior coxa. C, carinal crest.
Fig. 28. Same. Female. Head.
Fig. 29. *Solierella fossor.* Female paratype. From Boulder, Colorado.
Fig. 30. Same. Male paratype. Aedeagal lobe. From Rifle, Colorado.
Fig. 31. Same. Male paratype. Head and portion of antenna.
Fig. 32. Same. Male paratype. Last visible ventral segment.
Fig. 33. Same. Male paratype. Aedeagus and lateral lobes.
Fig. 34. Same. Male paratype. Portion of right wing.
Fig. 35. Same. Male paratype. Portion of left wing.
Fig. 36. *Solierella major.* Female. Fore tarsus, showing long bristles on outer side.
Fig. 37. *Solierella fossor.* Female. Fore tarsus, showing long bristles on outer side.
Fig. 38. *Solierella boharti.* Female. Fore tarsus, showing long bristles on outer side.
Fig. 39. *Solierella sonorae.* Female. Fore tarsus, showing long bristles on outer side.
Fig. 40. *Solierella striatipes.* Female. Fore tarsus, showing long bristles on outer side. In this species they are relatively short.
Fig. 41. *Solierella fossor.* Female. Ocelli.
Fig. 42. Same. Male. Ocelli.

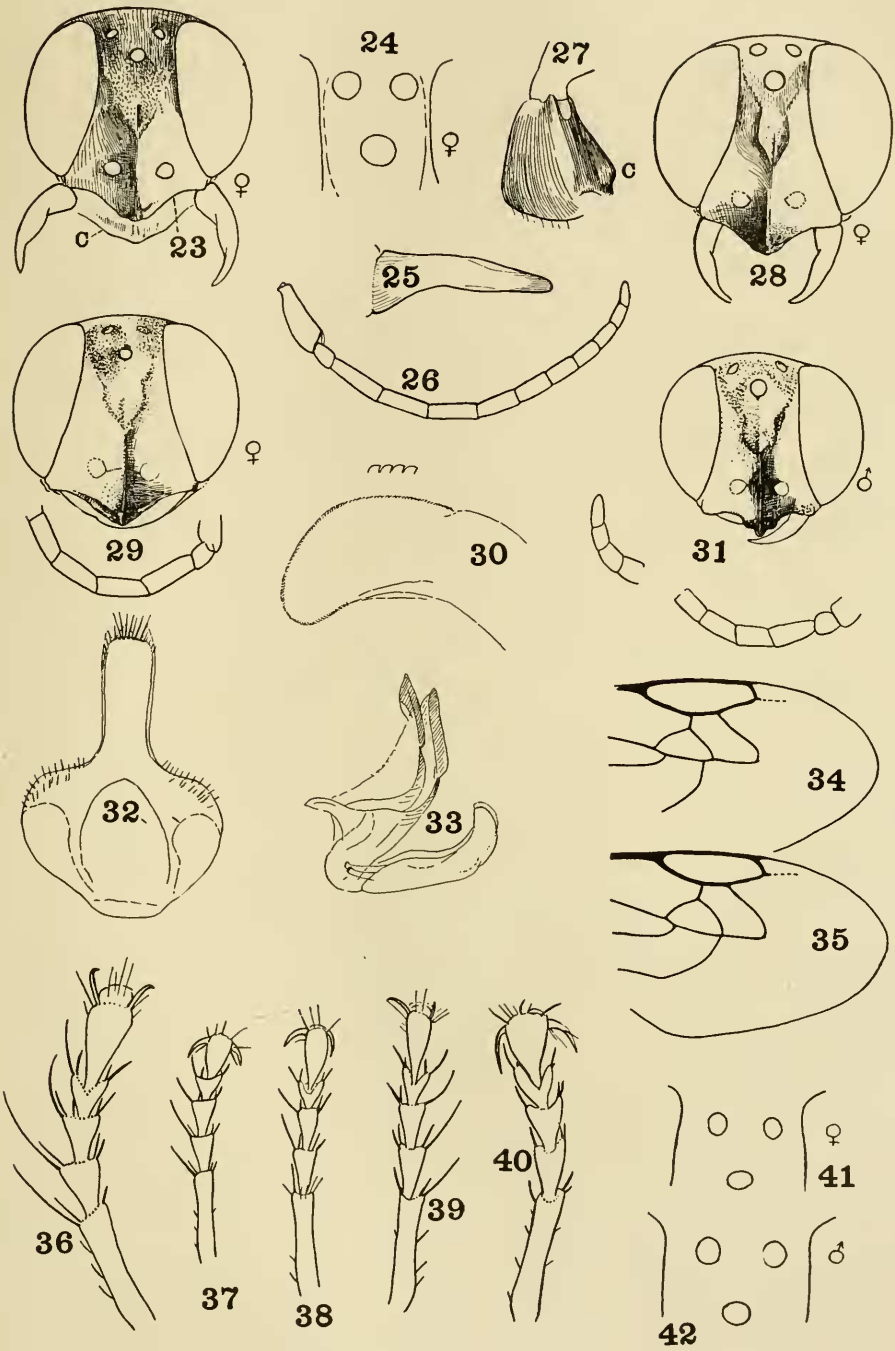
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PLATE 14

Fig. 43. *Solierella vierecki.* Female. Head. From Riverside, California.
Fig. 44. Same. Female. Antenna.
Fig. 45. *Solierella "parva."* Male paratype. Head. C, clypeal profile. This is probably a synonym of *vierecki.* From Boulder, Colorado.
Fig. 46. *Solierella vierecki.* Female. Ocelli.
Fig. 47. *Solierella "parva."* Male. Last visible ventral segment. From specimen of Fig. 45.
Fig. 48. Same. Male. Aedeagus and lateral lobe. From specimen of Fig. 45.
Fig. 49. Same. Male. Aedeagal lobe. From specimen of Fig. 45.
Fig. 50. *Solierella vierecki.* Female. Wing.
Fig. 51. *Solierella "parva."* Male. From Boulder, Colorado. Specimen of Fig. 45
Fig. 52. *Solierella plenoculoides.* Male. From Boulder, Colorado.
Fig. 53. Same. Male. Lateral lobe and aedeagus. From Boulder, Colorado.
Fig. 54. Same. Male. Last visible ventral segment.
Fig. 55. Same. Male. Aedeagal lobe.
Fig. 56. *Solierella sayi.* From Lone Mountain, San Francisco, California.

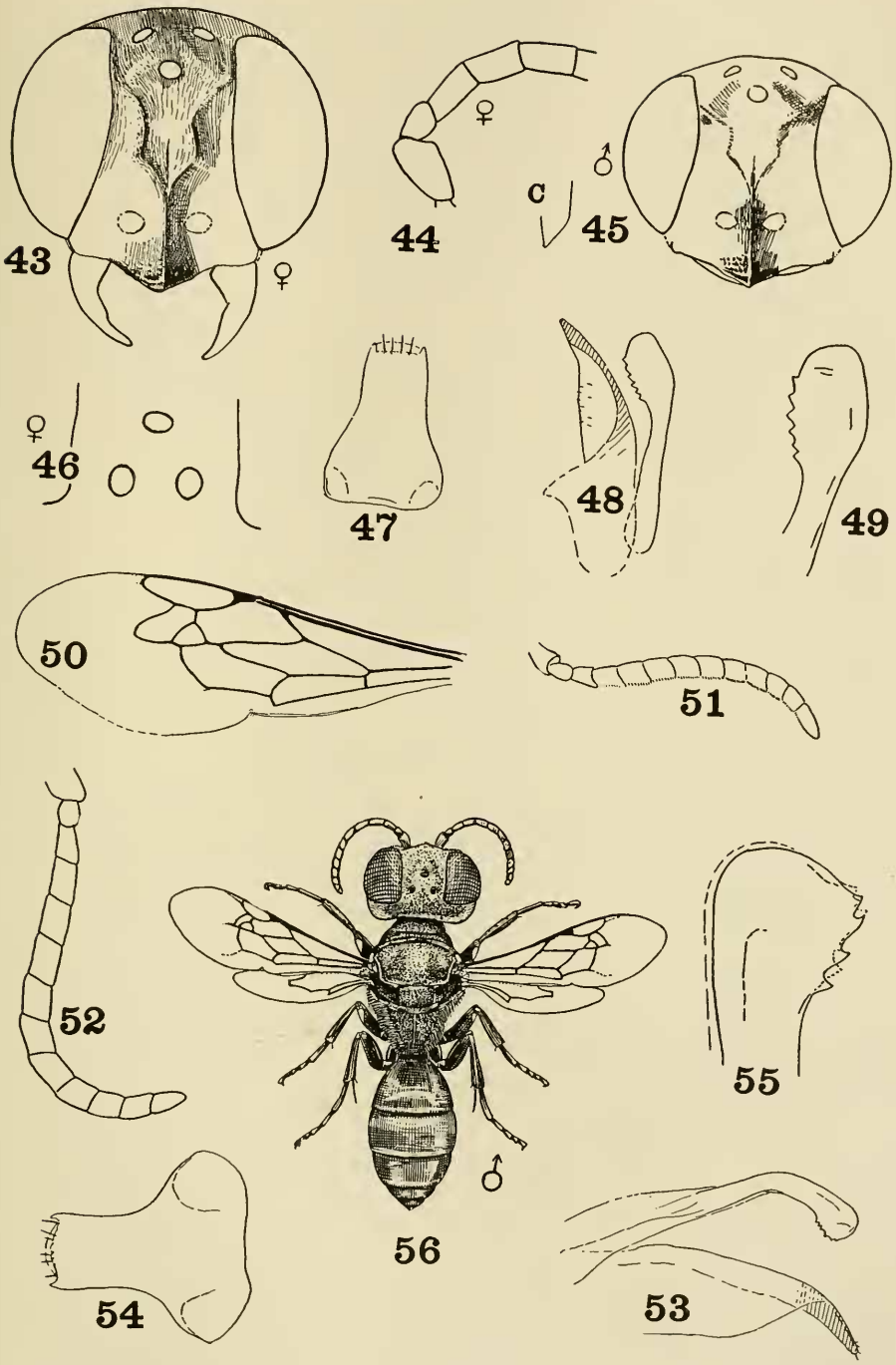
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PLATE 15

Fig. 57. *Solierella similis.* Female. Head, antenna, and clypeal profile.
Fig. 58. Same. Female. Fore tarsus.
Fig. 59. Same. Male. Fore coxa and trochanter from in front.
Fig. 60. Same. Male. Head and antenna.
Fig. 61. Same. Female. Posterior coxa, to show carina.
Fig. 62. Same. Male. Wing.
Fig. 63. Same. Male. Lateral lobes and aedeagus.
Fig. 64. Same. Male. Aedeagal lobe.
Fig. 65. Same. Male. Last visible ventral segment.
Fig. 66. Same. Female. Ocelli.
Fig. 67. *Solierella vandykei.* Female. Head.
Fig. 68. Same. Female. Frontal and clypeal profile.
Fig. 69. *Solierella lasseni.* Male. Head and antenna.
Fig. 70. Same. Male. Frontal view and clypeal profile.
Fig. 71. Same. Male. Lateral lobes and aedeagus.
Fig. 72. Same. Male. Last visible ventral segment.
Fig. 73. Same. Male. Fore trochanter, from in front.
Fig. 74. Same. Male. Lobes of aedeagus.

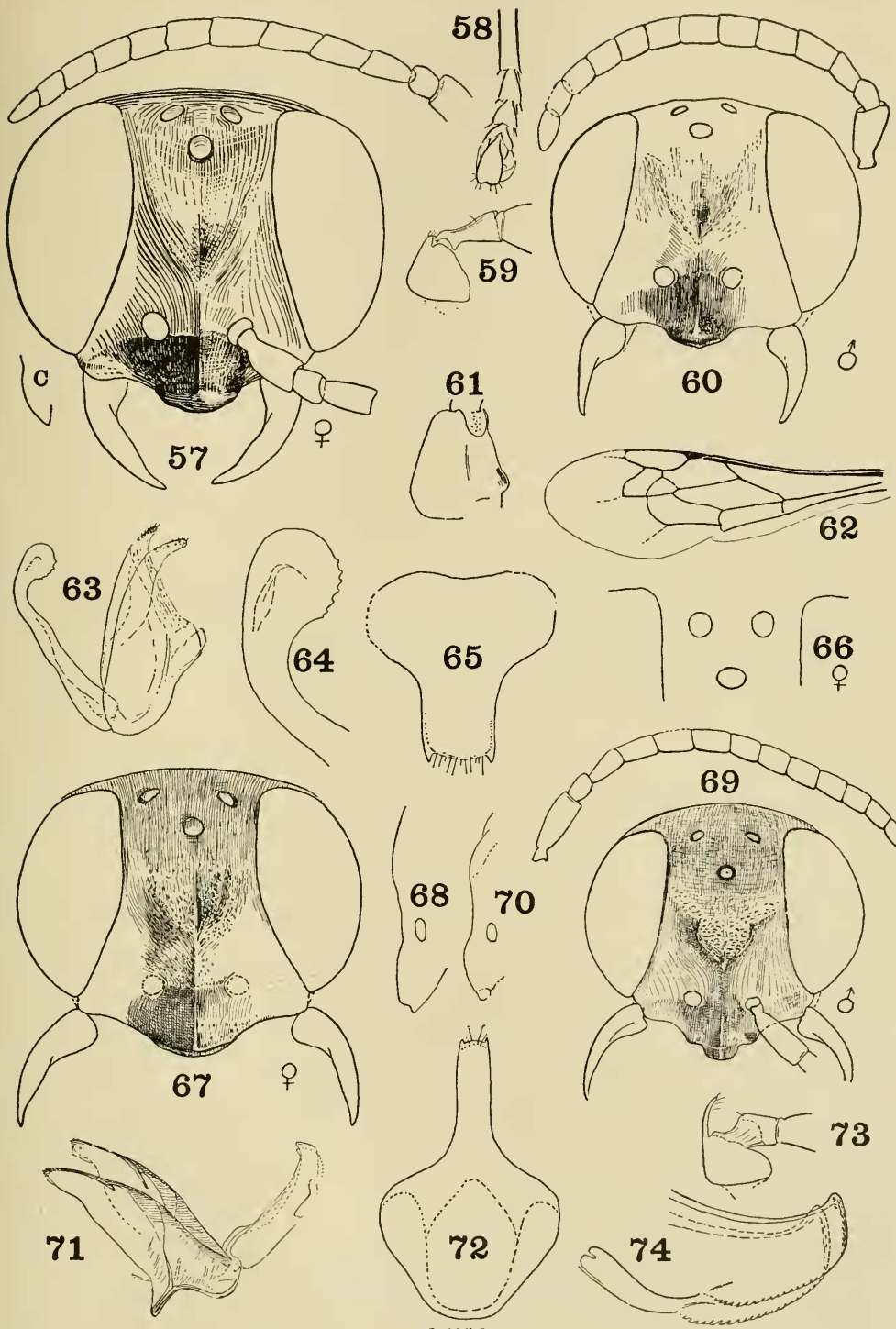
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PLATE 16

Fig. 75. *Solierella corizi.* Female. Head and antenna.
Fig. 76. Same. Female. Mandible, from side.
Fig. 77. Same. Male. Extremity of outer lobe or clasper.
Fig. 78. Same. Male. Head and apical portion of antenna. A, outer side. B, inner side.
Fig. 79. Same. Female. Posterior coxa, showing thorn at C.
Fig. 80. Same. Male. Wing.
Fig. 81. Same. Male. Aedeagal lobe.
Fig. 82. Same. Male. Aedeagus and lateral lobes.
Fig. 83. Same. Male. Last visible ventral segment.
Fig. 84. Same. Male. To show first recurrent vein entering first cubital cell.
Fig. 85. Same. Male. Fore coxae and trochanters, from in front.
Fig. 86. Same. Female. Ocelli.
Fig. 87. Same. Male. To show tubercles of vertex developed. From Riverside, California.
Fig. 88. *Solierella inerme*, or relative. Male. Antenna, lobe of aedeagus, and last visible ventral segment. From Kansas.
Fig. 89. Same. Female. From Kansas.
Fig. 90. Same. Female. From Kansas.
Fig. 91. Same. Male. With indication of tubercle on vertex. From Kansas.
Fig. 92. *Solierella lucida.* Male. Lateral lobe. From Boulder, Colorado.
Fig. 93. Same. Male. Aedeagus. From Boulder, Colorado.
Fig. 94. Same. Male. Aedeagal lobe. From Boulder, Colorado.

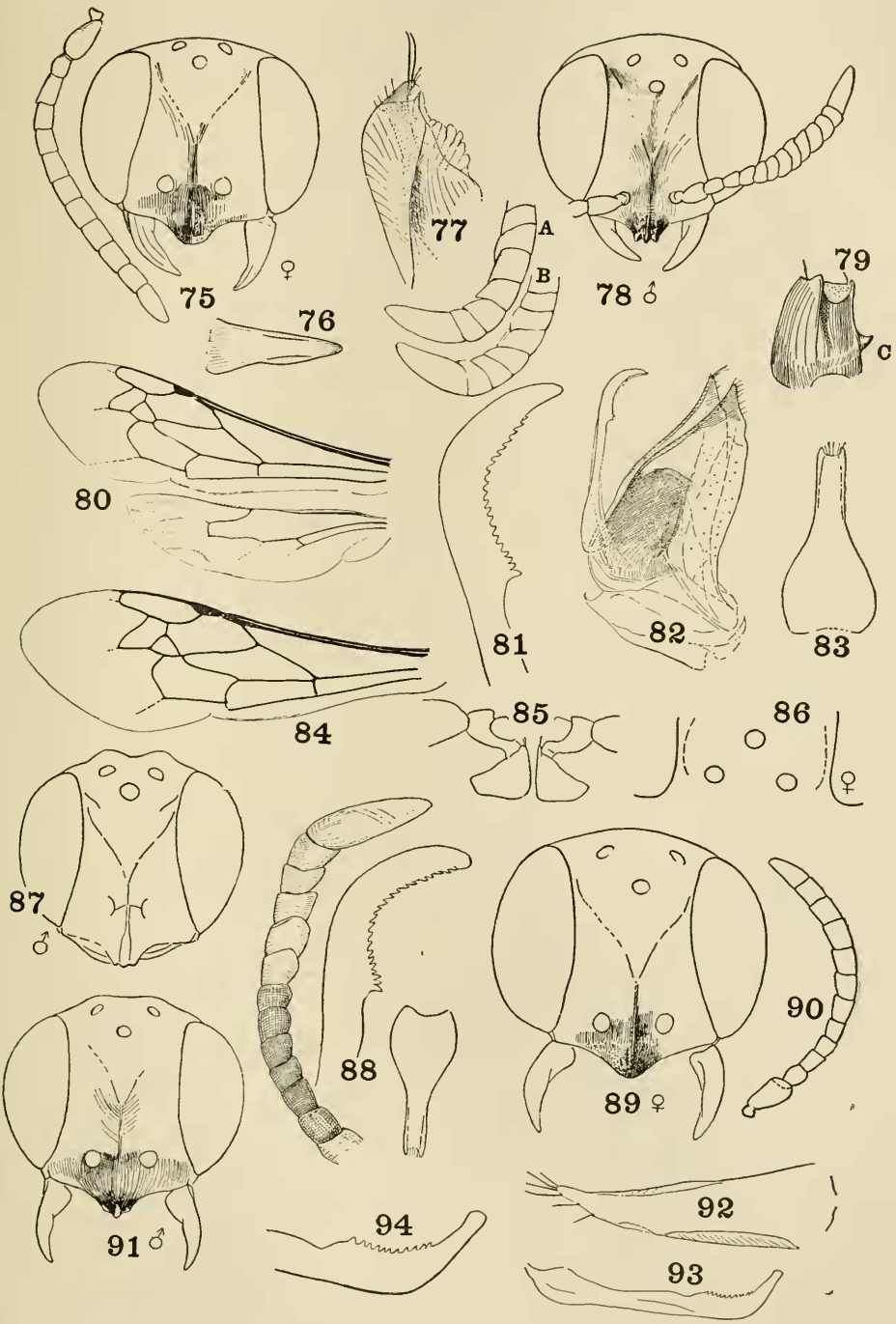
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PLATE 17

Fig. 95. *Solierella rohweri.* Female. From Hawaii.

Fig. 96. *Solierella blaisdelli.* Female. C, clypeus more enlarged.

Fig. 97. *Solierella nigra.* Female. C, clypeus of male. Both from central California.

Fig. 98. *Solierella rohweri.* Male. C, clypeal profile. From Hawaii.

Fig. 99. Same. Female. Clypeal profile. From Hawaii.

Fig. 100. *Solierella blaisdelli.* Female and male. Clypeal profiles.

Fig. 101. *Solierella australis.* Male. Forewing with only two cubital cells.

Fig. 102. *Solierella rohweri.* Wing. From Hawaii.

Fig. 103. *Solierella australis.* Male. Right wing with two, left wing with three cubital cells.

Fig. 104. *Solierella blaisdelli.* Female. Wing with second cubital cell incomplete.

Fig. 105. Same. Male. Lobe of aedeagus. In this specimen each lobe has 8 teeth.

Fig. 106. *Solierella nigra.* Male. Paratype. Last visible ventral segment. From Boulder, Colorado.

Fig. 107. Same. Male. Paratype. Aedeagal lobe. In this specimen each lobe has 5 teeth.

Fig. 108. *Solierella rohweri.* Male. Antenna and aedeagal lobes of two specimens. A, aedeagal lobe of specimen having 4 teeth on one lobe and 4½ on the other. B, aedeagal lobe of specimen having 3 teeth on each lobe. All from Hawaii.

Fig. 109. *Solierella nigra* (probably). Male. Aedeagal lobe of specimen having 6 teeth on the other lobe.

Fig. 110. *Solierella blaisdelli.* Female. Posterior coxa, showing carinal process in profile.

Fig. 111. Same. Female. Ocelli.

Fig. 112. *Solierella rohweri.* Fore coxae and trochanters, from in front. From Hawaii.

Fig. 113. *Solierella nigra.* Female. Disc of propodeum, general structure. From Riverside, California.

Fig. 114. *Solierella blaisdelli.* Female. Disc of propodeum, general structure. From Riverside, California.

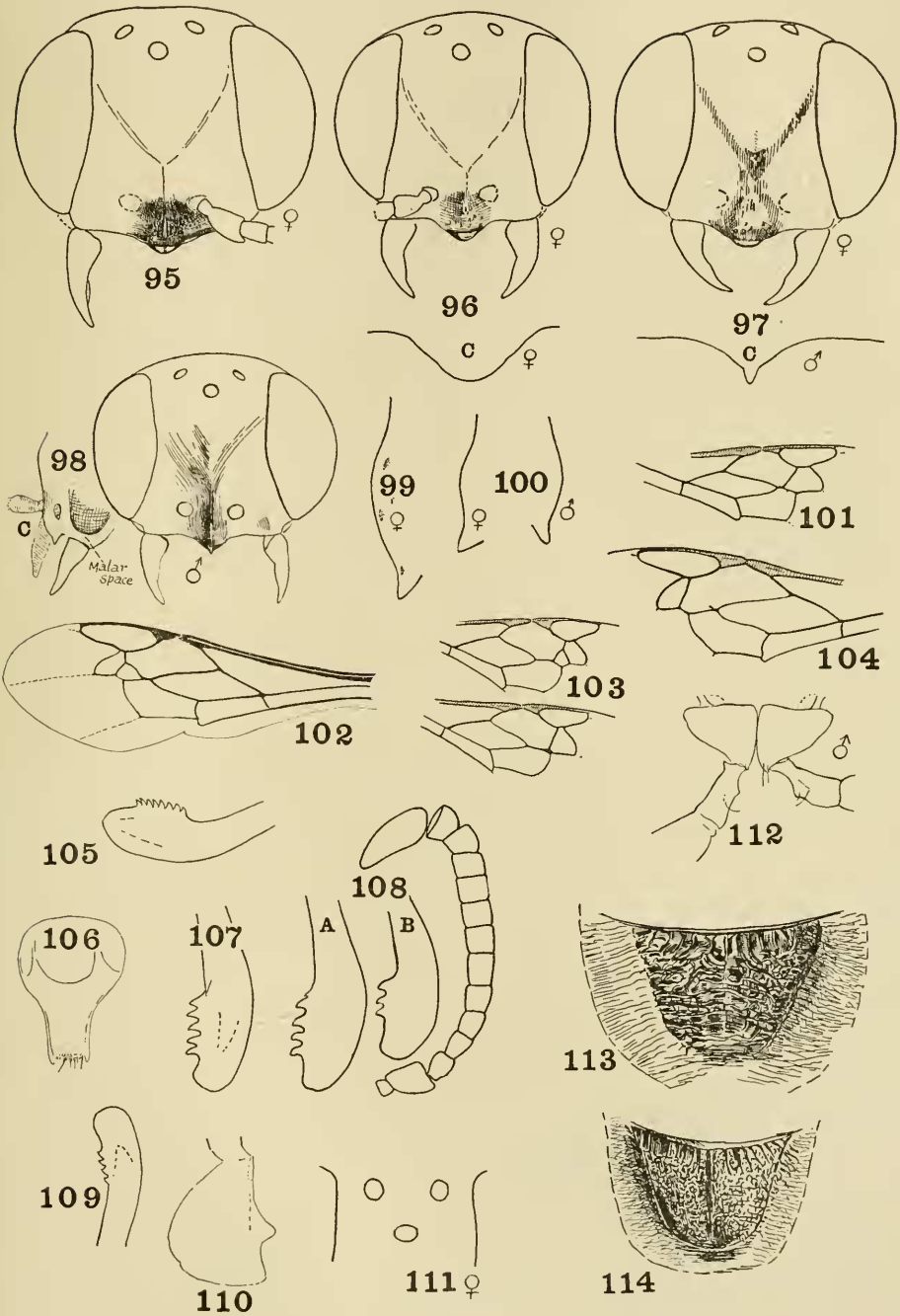
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PLATE 18

Fig. 115. *Solierella arcuata.* Male. From Menlo Park, California.
Fig. 116. Same. Female. From Menlo Park, California.
Fig. 117. *Solierella abdominalis.* Male. From Palm Springs, California.
Fig. 118. Same. Female. C, clypeal profile.
Fig. 119. *Solierella timberlakei.* Female. Clypeus and its profile.
Fig. 120. *Solierella blaisdelli.* Male. From Plumas County, California.
Fig. 121. *Solierella levis.* Female. Head and clypeal profile.
Fig. 122. *Solierella bridwelli.* Female. At C, clypeal profiles of male and female.
Fig. 123. Same. Male. Clypeal outline.
Fig. 124. *Solierella nitens.* Female. Head.
Fig. 125. *Solierella albipes.* Male. From Redwood City, California.
Fig. 126. Same. Female. Lower part of head.
Fig. 127. Same. Male. Mandible, from outer side.
Fig. 128. Same. Female. Clypeus.
Fig. 129. Same. Male. Clypeus. From southern California.
Fig. 130. *Solierella australis* var. Male. Clypeus. From Riverside, California.

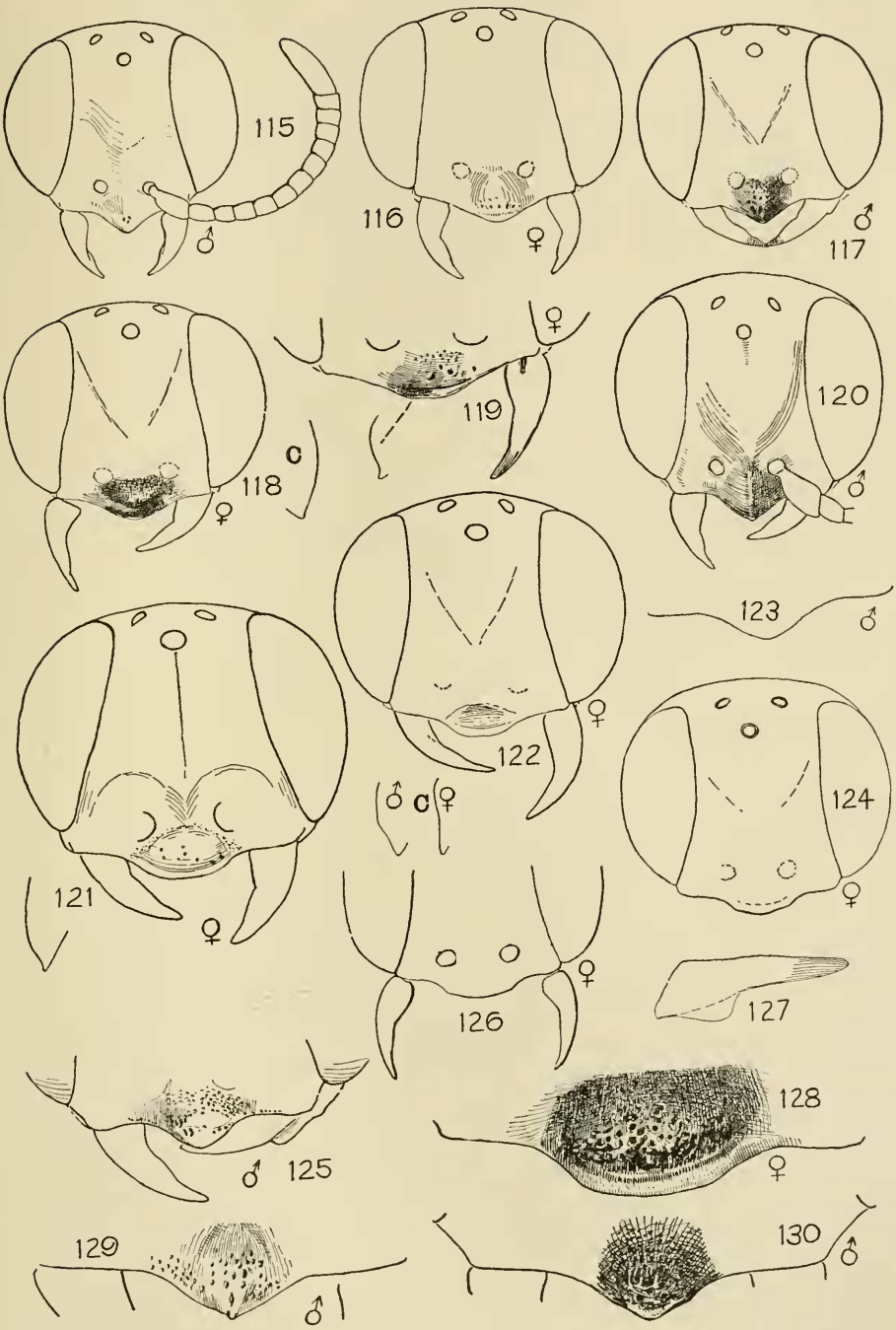
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PLATE 19

Fig. 131. *Solierella abdominalis.* Female. Ocelli.
Fig. 132. *Solierella bicolor.* Female. Apical portion of antenna, from side.
Fig. 133. *Solierella abdominalis.* Female. Apical portion of antenna, from side.
Fig. 134. Same. Male. Apical portion of antenna, from side.
Fig. 135. *Solierella bridwelli.* Female. Mandible and antenna, from side.
Fig. 136. Same. Male. Antenna, from side.
Fig. 137. *Solierella australis.* Female. Apical portion of antenna, from side.
Fig. 138. *Solierella arcuata.* Female. Apical portion of antenna, from side.
Fig. 139. *Solierella australis.* Male. Apical portion of antenna, from side.
Fig. 140. *Solierella arcuata.* Male. Apical portion of antenna, from side.
Fig. 141. *Solierella albipes.* Male. Antenna. From central California.
Fig. 142. *Solierella levis.* Female. Mandible, from outer side.
Fig. 143. *Solierella blaisdelli.* Male. Antenna.
Fig. 144. Same. Male. Fore coxa in two positions, to show mucro.
Fig. 145. *Solierella bridwelli.* Male. Aedeagus and lateral lobes.
Fig. 146. *Solierella albipes.* Female. Antenna. From central California.
Fig. 147. *Solierella arcuata.* Male. Aedeagal lobe.
Fig. 148. *Solierella blaisdelli.* Male. Last visible ventral segment.
Fig. 149. *Solierella australis.* Male. Aedeagus.
Fig. 150. Same. Male. Aedeagus.
Fig. 151. *Solierella albipes.* Male. Aedeagal lobe. From Whittier, California.
Fig. 152. *Solierella abdominalis.* Male. Aedeagal lobe.
Fig. 153. *Solierella bridwelli.* Male. Aedeagal lobe.
Fig. 154. *Solierella blaisdelli.* Male. Aedeagus.

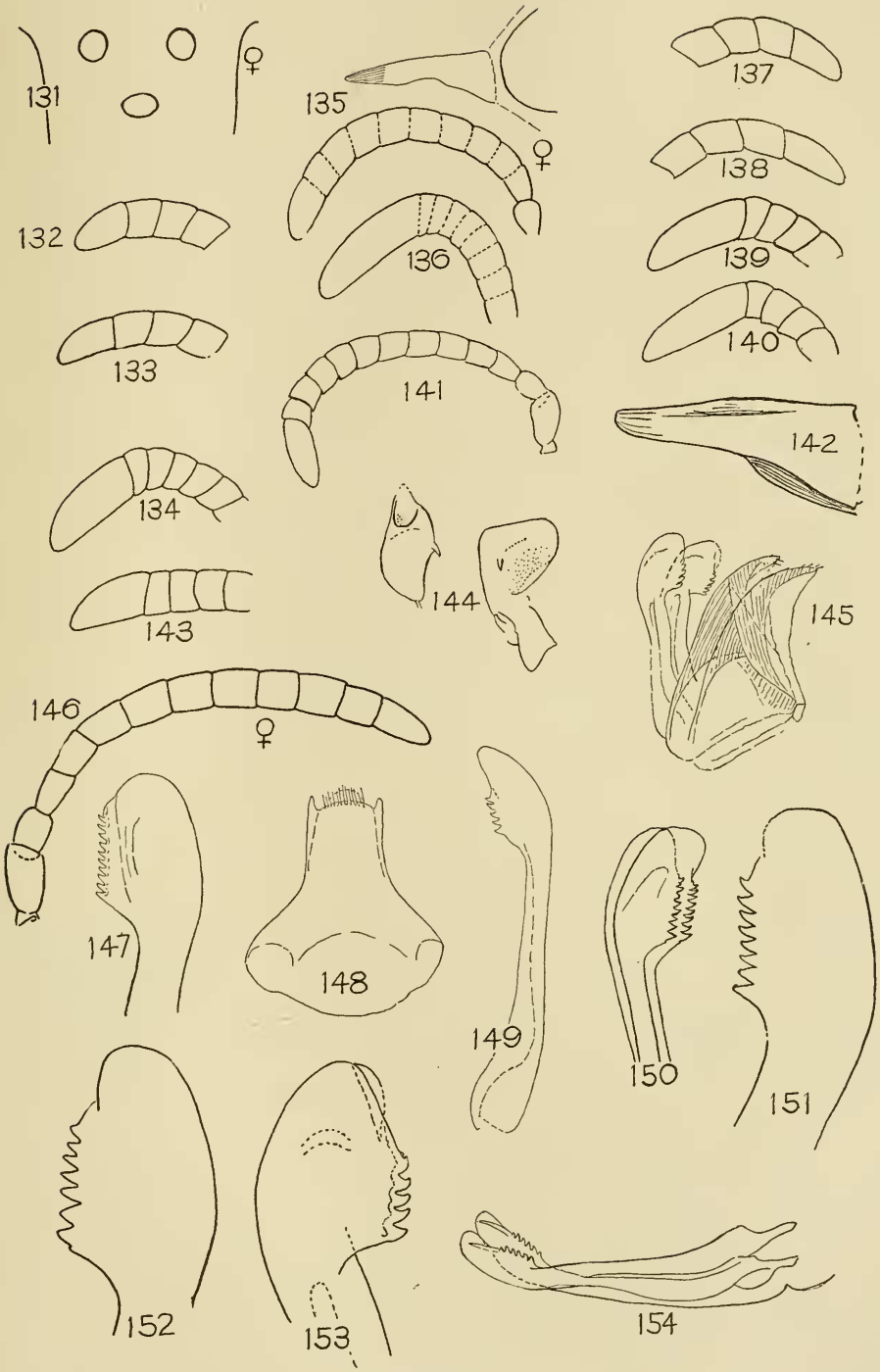
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PLATE 20

Fig. 155. *Solierella sayi.* Female. From San Francisco, California.

Fig. 156. Same. Male. Head and extremity of antenna. From San Francisco, California.

Fig. 157. Same. Female. From Tahoe, California, 6500 ft.

Fig. 158. Same. Male. Aedeagal lobe. From San Francisco, California.

Fig. 159. Same. Male. Aedeagal lobe. From Riverside, California.

Fig. 160. Same. Male. Clypeus. Paratype (U.S.N.M.). From Florissant, Colorado.

Fig. 161. Same. Male. Aedeagal lobe. Paratype (U.S.N.M.). From Florissant, Colorado.

Fig. 162. Same. Female. Clypeus. From Tahoe, California, 6500 ft.

Fig. 163. Same. Male. The pair of aedeagal lobes.

Fig. 164. Same. Male. Last visible ventral segment. From San Francisco, California.

Fig. 165. Same. Male. Fore coxa and trochanter, from in front.

Fig. 166. Same. Male. Paratype. Last visible ventral segment.

Fig. 167. *Solierella californica.* Female. Head. From Los Angeles, California.

Fig. 168. *Solierella sayi.* Female. Pygidial area. From San Francisco, California.

Fig. 169. Same. Male and female. Ocelli.

Fig. 170. *Solierella californica.* Male. Aedeagal lobe of specimen having 3 teeth on one lobe and 4 on the other. From Los Angeles, California.

Fig. 171. Same. Male. From Los Angeles, California.

Fig. 172. Same. Male and female. Antennae. From Los Angeles, California.

Fig. 173. *Solierella sayi.* Wing. From San Francisco.

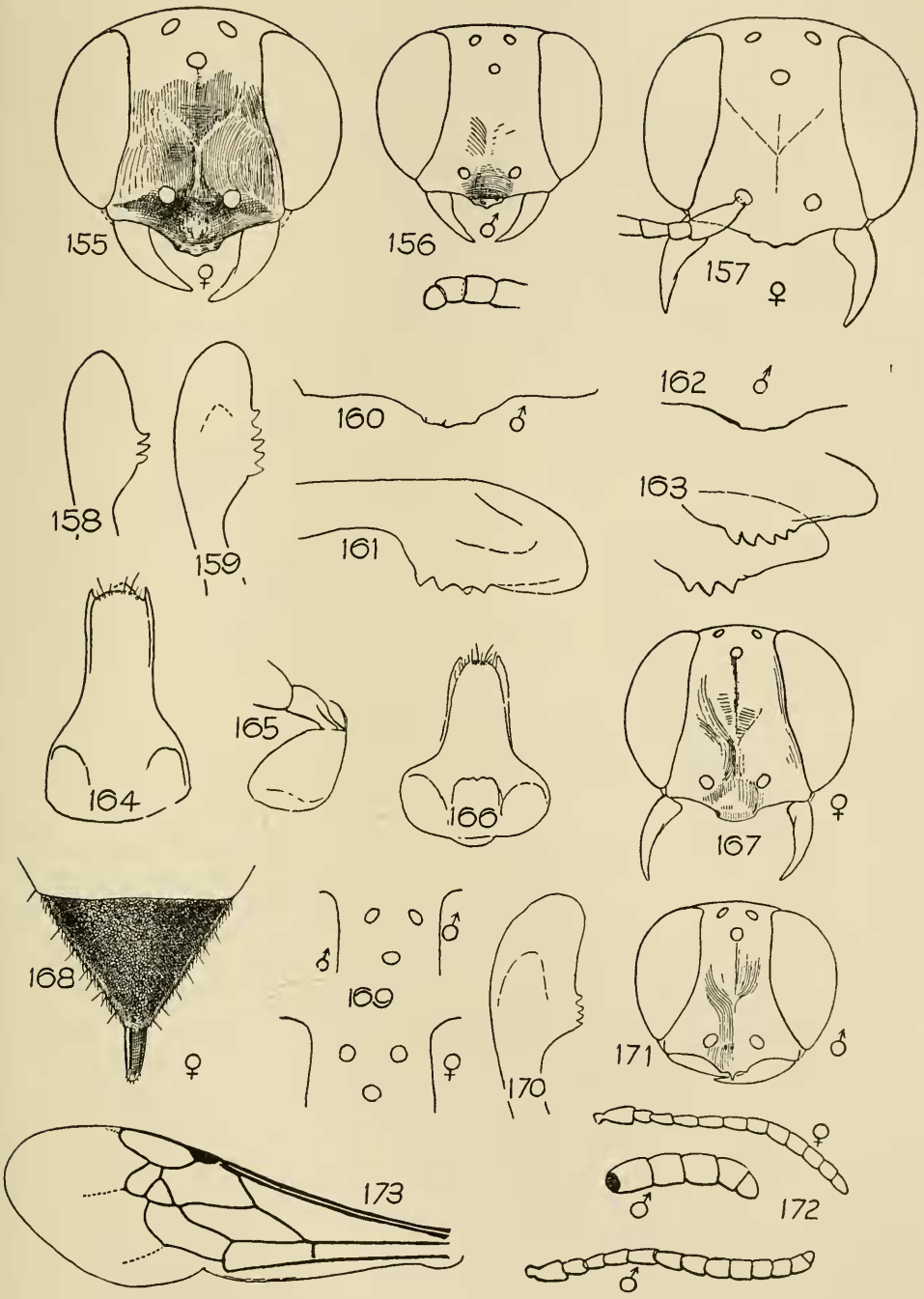
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PLATE 21

Fig. 174. *Solierella lasseni.* Male. Shaded area is pronotum in profile.

Fig. 175. *Solierella similis.* Male. Shaded area is pronotum in profile.

Fig. 176. Same. Male. Metatarsus, dorsal view.

Fig. 177. *Solierella sayi.* Male. Metatarsus, dorsal view.

Fig. 178. *Solierella levis.* Female. Fore tarsus.

Fig. 179. *Solierella albipes.* Female. Fore tarsus.

Fig. 180. *Solierella sayi.* Female. Fore tarsus.

Fig. 181. *Solierella californica.* Female. Fore tarsus.

Fig. 182. *Solierella arcuata.* Male. Mandible, outer broadside view. From Sierra Nevada, California.

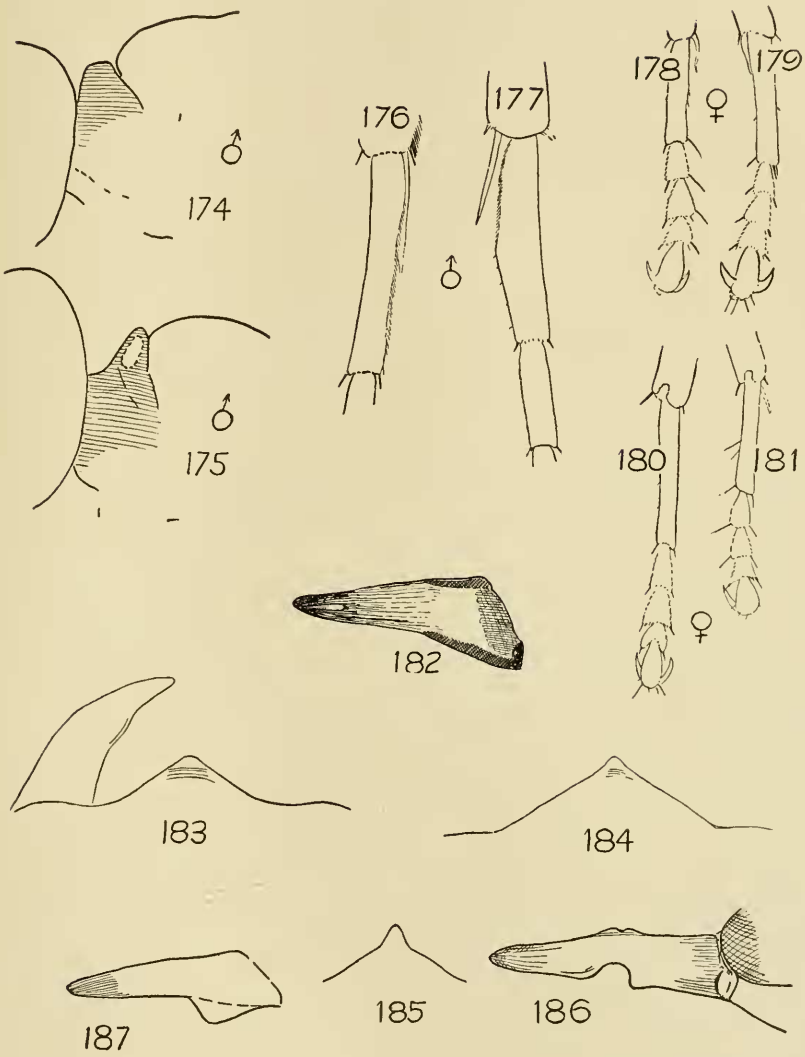
Fig. 183. *Solierella blaisdelli.* Male. Clypeus. From Whittier, California, August 11, 1920 (No. 1234).

Fig. 184. Same. Male. Clypeus. From Whittier, California, August 11, 1920 (No. 1238).

Fig. 185. Same. Male. Clypeus. From Whittier, California, August 11, 1920 (No. 1239).

Fig. 186. *Plenoculus* sp. Female. Mandible, outer broadside view. From Riverside, California.

Fig. 187. *Solierella albipes.* Male. Mandible, outer broadside view.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